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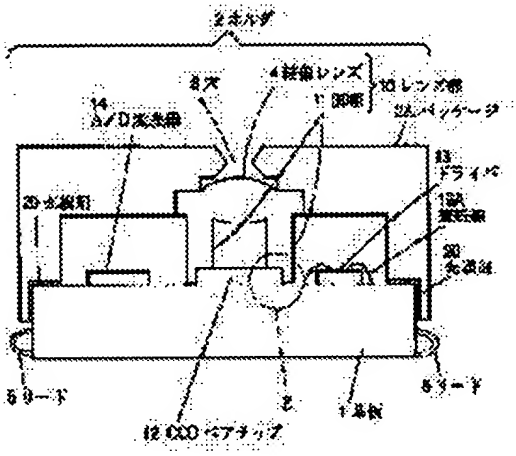
(54) IMAGE PICKUP DEVICE AND ITS PRODUCTION, IMAGE PICKUP ADAPTER DEVICE, DEVICE AND METHOD FOR PROCESSING SIGNAL AND DEVICE AND METHOD FOR PROCESSING INFORMATION

(57)Abstract:

PROBLEM TO BE SOLVED: To make an image pickup device in size small, thin in thickness and light in weight and, moreover, to facilitate its incorporation and treatment.

SOLUTION: A CCD bear chip 12 which photoelectrically converts light which is picked up by an image pickup lens 4 provided at a holder 2 and outputs an image signal is mounted on a substrate 1. The image pickup lens 4 is arranged in the holder 2 and its armor has a diaphragm effect for shielding a peripheral light beam and is adopted as a package 2A for shielding external light. The package 2A is provided with a circular hole 3 for permitting light from a subject to be made incident in the image pickup lens 4. The holder 2 is mounted on such a substrate so that the image pickup device is constituted.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] About an information processor and the information processing approach, especially this invention captures an image in image pick-up equipment and its manufacture approach, image pick-up adapter equipment, a signal processor and the signal-processing approach, and a list, for example, relates a video camera etc. to an information processor and the information processing approach in a miniaturization, the image pick-up equipment lightweight-ize and it enables it to offer by the low price and its manufacture approach, image pick-up adapter equipment, a signal processor and the signal-processing approach, and a list at them.
[0002]
[Description of the Prior Art] Drawing 54 shows the configuration of an example of the conventional video camera. This video camera consists of a lens module 101 and a body 111 of a camera. Moreover, the lens module 101 consists of an image formation lens 102 containing the focal lens 104, and an iris adjustment device 103, and the body 111 of a camera consists of optics (low pass filter) LPF 112, image sensors 113, and a camera processing circuit 114.
[0003] Outgoing radiation of the light from the photographic subject by which incidence was carried out to the image formation lens 102 is carried out to image sensors 113 through the iris adjustment device 103 and optics LPF 112, and, thereby, image formation of the image of a photographic subject is carried out on the light-receiving side of image sensors 113. Image sensors 113 become by a charge-coupled device (suitably henceforth CCD) etc., carry out photo electric translation of the light as an image of the photographic subject received in respect of light-receiving, and output the picture signal corresponding to the photographic subject acquired as a result to the camera processing circuit 114. In the camera processing circuit 114, to the picture signal from image sensors 113, predetermined signal processing is performed, and in order to be recorded on record media, such as after that, for example, a video tape etc., to be outputted and displayed on a monitor etc. or to perform predetermined processing further again, a computer etc. is supplied.
[0004] In addition, it is made by image sensors 113 as [supply / from the camera processing circuit 114 / a drive signal], and, as for image sensors 113, predetermined processing of the output of a picture signal etc. is performed to them according to this drive signal. Moreover, the iris adjustment device 103 adjusts the brightness of the image by which image formation is carried out on image sensors 113, and is made as [intercept / the marginal ray unnecessary to image formation by which outgoing radiation was carried out from the image formation lens 102]. Furthermore, the focal lens 104 is made as [adjust / the focus of the image by which image formation is carried out on image sensors 113]. Moreover, optics LPF 112 is the optical element which has the refractive index which changes with plane of polarization of the light by which incidence is carried out there, for example, becomes with crystalline Xtal with an optical anisotropy etc., controls the high-frequency component of the spatial frequency of the light from the focal lens 104, and is made as [reduce / this / clinch distortion produced with image sensors 113].
[0005] By the way, in order to input an image into a computer, when using a video camera for the monitor of an automobile etc., or when applying it to the so-called TV phone machine, a video conference system, etc., high definition [the image obtained from a video camera] is seldom required. That is, even if image quality is not so high, a video camera with the easy inclusion and handling is

usually required.
[0006] However, while a production process will be complicated since optical adjustment is needed at the time of manufacture if it is going to make inclusion and handling easy conventionally, equipment is enlarged and the price also becomes high.
[0007] Furthermore, although optics LPF 112 was needed in the conventional video camera as shown in drawing 54 in order to restrict the spatial frequency of the light which carries out incidence to image sensors 113, this thickness d needed to be made into the thickness proportional to the pixel pitch of image sensors 113. For this reason, when the prices of image sensors 113 become high when what has a small pixel pitch is used as image sensors 113, and what has a big pixel pitch is used, it is necessary to establish the thick optics LPF 112 of thickness d, and equipment is enlarged.
[0008] Then, the thing of a configuration as shown in drawing 55 is known more as a miniaturization and a low-cost-ized video camera. In this example, CCD image sensor 403 is being fixed on the substrate 404. Moreover, one image formation lens 401 is being fixed to the lens-barrel 402, and this lens-barrel 402 is fixed to it to a substrate 404. Various kinds of components 405 are attached in the background of a substrate 404.
[0009] In addition, as for the configuration of the adjustment device in which the quantity of light is adjusted etc., the graphic display is omitted in the example of drawing 55 .
[0010] CCD image sensor 403 in here is constituted as shown in drawing 5656 . That is, CCD image sensor 403 is equipped with CCD bare chip 403A which carries out photo electric translation of the inputted light. This CCD bare chip 403A has the light filter (not shown) which passes only the light of the wavelength of the predetermined color of R, G, and B (there may be the complementary color) to that optical plane-of-incidence side. CCD bare chip 403A is held in the interior of package 403B which consists of plastics etc., and cover glass 403C is arranged at the upper bed of package 403B.
[0011]
[Problem(s) to be Solved by the Invention] However, in the example of a configuration shown in drawing 55 , the distance from 5mm and the top face of a substrate 404 to the soffit of components 405 is set [the distance to the top face of CCD image sensor 403] to about 15mm by the thickness of about 30mm and CCD image sensor 403, and the sum total is set to about 50mm from the upper bed of the image formation lens 401.
[0012] Therefore, the configuration as shown in drawing 55 was included in the PC card etc., and the technical problem which cannot be used in a portable personal computer etc. occurred.
[0013] This invention is made in view of such a situation, and inclusion and handling are easy and it enables it to offer small and lightweight equipment by the low price.
[0014]
[Means for Solving the Problem] Image pick-up equipment according to claim 1 has the drawing effectiveness which intercepts a marginal ray that at least one image-formation lens to which image formation of the light is carried out was prepared, photo electric translation of the light by which image formation was carried out at least with the image-formation lens carries out to the holder of sheathing which intercepts outdoor daylight, it is image pick-up equipment equipped with the substrate with which it was equipped with the optoelectric transducer which outputs a picture signal, and a holder and a substrate are characterized by to be unified.
[0015] The manufacture approach of image pick-up equipment according to claim 15 carries out photo electric translation of the light by which incidence was carried out, and is characterized by having the step which forms the step which equips a substrate with the optoelectric transducer which outputs a picture signal, and the part which intercepts a marginal ray to one image formation lens to which image formation of the light is carried out on an optoelectric transducer, and the step which unifies an image formation lens to a substrate.
[0016] One image formation lens to which image pick-up equipment according to claim 16 carries out image formation of the light, When carrying out photo electric translation of the light by which image formation was carried out with the image formation lens at least and setting to F the f number which is image pick-up equipment equipped with the substrate with which it was equipped with the optoelectric transducer which outputs a picture signal, and is specified with the pupil diameter D and focal distance f of an image formation lens, An optoelectric transducer is characterized by setting the pitch of the

effective pixel as the larger value of an image pick-up service area than 1/(200F).
[0017] Image pick-up equipment according to claim 17 carries out photo electric translation of the light by which image formation was carried out with one image formation lens to which image formation of the light is carried out, and image formation lens, it has the optoelectric transducer which outputs a picture signal, and an image formation lens is characterized by the part touching an optoelectric transducer and directly.
[0018] Image pick-up equipment according to claim 21 carries out photo electric translation of the light which carries out incidence to a light-receiving side, and is equipped with the optoelectric transducer which outputs a picture signal, and the A/D converter which carries out A/D conversion of the picture signal outputted from an optoelectric transducer, and an optoelectric transducer and an A/D converter are characterized by being included in one package.
[0019] A signal processor according to claim 26 is a signal processor which processes the digital image data which carried out A/D conversion of the picture signal outputted from the charge-coupled device. To the timing of a clock that image data has one half of the periods of the period to which a charge-coupled device outputs a picture signal When carrying out A/D conversion of the picture signal, it is characterized by having an operation means to calculate the difference of a delay means by which image data is delayed by one clock, image data, and the output of a delay means, and an output means to output alternately the difference outputted from an operation means.
[0020] The signal-processing approach according to claim 27 is the signal-processing approach of processing the digital image data which carried out A/D conversion of the picture signal outputted from the charge-coupled device. To the timing of a clock that image data has one half of the periods of the period to which a charge-coupled device outputs a picture signal When carrying out A/D conversion of the picture signal, it is characterized by having the step which calculates the difference of the step delayed by one clock in image data, image data, and the image data delayed by one clock, and the step which outputs difference alternately.
[0021] Image pick-up adapter equipment according to claim 28 is equipped with the case with which an information processor is equipped free [attachment and detachment], and the image pick-up equipment held in a case. Image pick-up equipment The holder of sheathing which has the drawing effectiveness which intercepts a marginal ray that one image formation lens to which image formation of the light is carried out was prepared, and intercepts outdoor daylight, Photo electric translation of the light by which image formation was carried out with the image formation lens is carried out, and it is equipped with the optoelectric transducer which outputs a picture signal, and is characterized by having the substrate united with the holder.
[0022] An information processor according to claim 32 is characterized by having a taking-in means to incorporate the picture signal from image pick-up equipment, and a processing means to process the picture signal incorporated by the taking-in means.
[0023] The information processing approach according to claim 33 is characterized by having the step which incorporates the picture signal from image pick-up equipment, and the step which processes the incorporated picture signal.
[0024] In image pick-up equipment according to claim 1, a holder has the drawing effectiveness that the sheathing intercepts a marginal ray, and is made as [intercept / outdoor daylight], and at least one image formation lens to which image formation of the light is carried out is prepared there. Photo electric translation of the light by which image formation was carried out with the image formation lens is carried out to a substrate at least, and it is equipped with the optoelectric transducer which outputs a picture signal. And these holders and substrates are unified.
[0025] It has the drawing effectiveness which intercepts a marginal ray that carried out photo electric translation of the light by which incidence image formation was carried out in the manufacture approach of image pick-up equipment according to claim 15, and one image formation lens to which image formation of the light is carried out was prepared on the optoelectric transducer at the substrate with which it was equipped with the optoelectric transducer which outputs a picture signal, and is made as [equip / with the holder of sheathing which intercepts outdoor daylight].
[0026] In image pick-up equipment according to claim 16, the pitch of the effective pixel of an optoelectric transducer is set as the larger value of an image pick-up service area than 1/(200F).

[0027] In image pick-up equipment according to claim 17, a part of one image formation lens to which image formation of the light is carried out carries out photo electric translation of the light by which image formation was carried out with the image formation lens, and it is made as [contact / the optoelectric transducer which outputs a picture signal, and directly].
[0028] In image pick-up equipment according to claim 21, an optoelectric transducer carries out photo electric translation of the light which carries out incidence to a light-receiving side, and is made as [output / a picture signal]. The A/D converter is made as [carry out / A/D conversion of the picture signal outputted from an optoelectric transducer]. And these optoelectric transducers and A/D converters are built into one package.
[0029] In the signal processor according to claim 26 and the signal-processing approach according to claim 27, image data is delayed by one clock, and the difference of image data and the image data delayed by one clock is calculated, and it is made as [output / difference / alternately].
[0030] In image pick-up adapter equipment according to claim 28, image pick-up equipment is held in a case, and the holder which has an image formation lens and drawing is united with the substrate with which it is equipped with the optoelectric transducer by image pick-up equipment.
[0031] In an information processor according to claim 32 and the information processing approach according to claim 33, the picture signal outputted from the optoelectric transducer of the image pick-up equipment held in the case is incorporated and processed.
[0032]
[Embodiment of the Invention] Hereafter, the example of this invention is explained with reference to a drawing.
[0033] [1st example] drawing 1 is the perspective view showing the configuration of the 1st example of the image pick-up equipment which applied this invention. By equipping a substrate 1 with a holder 2 (fitting), they are unified and this image pick-up equipment is constituted. Photo electric translation of the light by which image formation was carried out at least with the image formation lens 4 prepared in the holder 2 is carried out to a substrate 1, and it is equipped with the CCD bare chip 12 as an optoelectric transducer which outputs a picture signal so that it may explain with reference to drawing 3 mentioned later. Moreover, one image formation lens 4 to which image formation of the light is carried out is formed in the holder 2, and the sheathing has the drawing effectiveness which intercepts such a marginal ray, and is set to package 2A which intercepts outdoor daylight further so that a marginal ray may not carry out incidence to the image formation lens 4. In addition, the hole (drawing) 3 of the circle configuration for carrying out incidence of the light from a photographic subject to the image formation lens 4 is established in package 2A. moreover -- this example -- a hole 3 -- the upper part of package 2A -- it is mostly prepared in the center and functions as a fixed iris.
[0034] Next, drawing 2 is the top view of the image pick-up equipment of drawing 1 , and drawing 3 is the sectional view of the A-A' part (part shown by the profile line in drawing 2) in drawing 2 . On the substrate 1, as mentioned above, it is equipped with the CCD bare chip 12, and also it is equipped with the driver 13 which drives the CCD bare chip 12, A/D converter 14 which carries out A/D conversion of the output of the CCD bare chip 12, and other required chips (for details, it mentions later with reference to drawing 18). In addition, when a substrate 1 is equipped with a holder 2, the hole 3 established in the holder 2 and a location which counters are equipped with the CCD bare chip 12. However, on the design of a substrate 1, when the stowed position of the CCD bare chip 12 is restricted, first, the stowed position of the CCD bare chip 12 is determined, and a hole 3 can be established in the CCD bare chip 12 and the location which counters after that.
[0035] Furthermore, the lead 5 for outputting a signal to the exterior and inputting a signal from the exterior (for example, in order taking out the picture signal with which it was outputted from the CCD bare chip 12, and predetermined processing was performed or supplying a power source to each chip with which the substrate 1 was equipped etc.) is formed in the side face of a substrate 1. In addition, the graphic display of lead 5 is omitted in drawing 1 .
[0036] Each chip with which the substrate 1 was equipped is connected by the path cord if needed. In addition, in drawing 3 , only path cord 13A currently pulled out from the driver 13 is illustrated, and since drawing becomes complicated, the path cord currently pulled out from other chips has been omitted.

[0037] Drawing 4 expresses the example of a configuration of the CCD bare chip 12. In this example, the CCD bare chip 12 is formed on CCD component (charge-coupled device) 12A which outputs the electrical signal corresponding to the inputted light, and CCD component 12A, and consists of light filter 12B which passes the light of predetermined wavelength, such as R, G, and B (there may be the complementary color). However, light filter 12B may be omitted.
[0038] The CCD bare chip 12 shown in this drawing 4 is compared with CCD image sensor 403 shown in drawing 56 , and it is made with the configuration that package 403B which consists of a ceramic shown in the CCD bare chip 12 shown in drawing 4 at drawing 56 or plastics was omitted so that clearly. Therefore, the magnitude can be made smaller compared with CCD image sensor 403 shown in drawing 56 .
[0039] The image formation lens 4 constitutes the lens section 10 with the leg 11. Here, drawing 5 is a perspective view showing the detail configuration of the lens section 10. as an ingredient with the transparent lens section 10 -- as [prepared / became with transparent plastics (for example, PMMA etc.), and / for example, / in the parallel plate / four feet] -- so to speak, the table configuration is carried out. Namely, the image formation lens 4 as a single ball lens is formed in a part for the core of a parallel plate, and the leg 11 which is four of the prism configurations whose configurations of a horizontal section are rectangles is further extended for example, formed in the direction parallel to the optical axis of the image formation lens 4 in four corners of the parallel plate at it. And it is each lower part of these four legs 11, and, as for the optical axis of the image formation lens 4, and the part of the angle which counters, notch 11A is formed in the prismatic form of ********** and this. In addition, each of the four legs 11 is prepared as countered with the optical axis of the image formation lens 4 in two of the four side faces (part of the angle which consists of the two side faces).
[0040] The configuration where the CCD bare chip 12 was seen from the top face (image pick-up side) is the chip of the shape for example, of a rectangle, and four each of notch 11A is made as [fit in / with a precision sufficient on four squares of the CCD bare chip 12].
[0041] In addition, in plastics, it consists of carrying out mould shaping (therefore, the image formation lens 4 is a plastics mould single ball lens), and thereby, a relative precision of the dimension of each part of the lens section 10 to the principal point of the image formation lens 4 is high enough, and the lens section 10 is carried out.
[0042] As shown in drawing 2 and drawing 3 , the lens section 10 constituted as mentioned above is the inside of package 2A of the lid configuration which constitutes sheathing of a holder 2, and fitting is carried out so that the optical axis of the image formation lens 4 may pass along the core of a hole 3 in a hole 3 and a corresponding location. And the four legs 11 of the lens section 10 touch the CCD bare chip 12 directly by [of the notch 11A] carrying out fitting to the part of four angles of the CCD bare chip 12, respectively.
[0043] Package 2A which constitutes sheathing of a holder 2 became with the polycarbonate resin as an ingredient of protection-from-light nature etc., similarly it has pasted up with the substrate 1 with the bulking agent (adhesives) 20 of protection-from-light nature, and, thereby, the substrate 1 and the holder 2 are unified.
[0044] Drawing 6 is the enlarged drawing (enlarged drawing of the part Z surrounded by the dotted line in drawing 3) to which the cross section of a part where the leg 11 and the CCD bare chip 12 touch was expanded. As shown in this drawing, after the soffit of the leg 11 has floated a little from the substrate 1, the base and side face of notch 11A have a certain amount of pressure in the light-receiving side (part shown by S1 among drawing) and side face of the CCD bare chip 12 (part shown by S2 among drawing), and touch directly (therefore, the leg 11 is made into the condition of so to speak having been dashed by the CCD bare chip 12). In addition, this pressure is made as [generate / by pasting up and closing a substrate 1 and a holder 2] by being filled up with a bulking agent 20, putting a predetermined pressure, after fitting a holder 2 into a substrate 1.
[0045] It is supposed that the dimension of the part which carries out fitting to the substrate 1 of a holder 2 is larger than the appearance of a substrate 1 for how many minutes, therefore the substrate 1 and the holder 2 are pasted up in the form which gives priority to the precision which contacts the leg 11 to the CCD bare chip 12.
[0046] As mentioned above, since the substrate 1 with which it was equipped with the CCD bare chip 12

at least, and the holder 2 of sheathing (package 2A) which has the drawing effectiveness that the image formation lens 4 was formed are made into one, the optical adjustment between the image formation lens 4 and the CCD bare chip 12 etc. is unnecessary at the time of the application in the case of applying image pick-up equipment to a video conference system etc., therefore the inclusion and handling become easy at it. Consequently, it becomes possible to reduce the manufacturing cost of the equipment using such image pick-up equipment.

[0047] Furthermore, as mentioned above, while relative precision over the principal point of the image formation lens 4 of the dimension of each part of the lens section 10 is made high enough, since the leg 11 (notch 11A) is directly dashed against the light-receiving side of the CCD bare chip 12, the image formation lens 4 is arranged with a sufficient precision, without the principal point carrying out special adjustment so that the light-receiving side and position relation of the CCD bare chip 12 may be filled. Namely, it is low cost and the image formation lens 4 can be mounted with a sufficient precision. Furthermore, since the adjustment device for mounting the image formation lens 4 with a sufficient precision in this case is unnecessary, miniaturization of image pick-up equipment and lightweight-ization can be attained.

[0048] In addition, projection 11Aa is generated to the notch 11A page of the leg 11 which presses the image pick-up side of the CCD bare chip 12, and the CCD bare chip 12 can be pressed by this projection 11Aa to it. In order for contact between the CCD bare chip 12 and the leg 11 to be theoretically performed by a point or the line by making this projection 11Aa hemispherical or cylindrical, it becomes possible to press the CCD bare chip 12 certainly irrespective of the precision of the field of the CCD bare chip 12 or the leg 11.

[0049] Or taper side 11Ab is formed in notch 11A of the leg 11, and you may make it press the edge of the upper bed section of the CCD bare chip 12 by this taper side 11Ab again, as shown in drawing 8 . If it does in this way, it will become possible to press the CCD bare chip 12 certainly irrespective of dispersion in the configuration of the CCD bare chip 12.

[0050] Next, with reference to drawing 9 and drawing 10 , the optical property of the image formation lens 4 and the dimension (die length) of the leg 11 are explained. As shown in drawing 9 (A), the focus location (image formation side) f1 of the image formation lens 4 curves, as a broken line shows. And the light-receiving side (image pick-up side) of the CCD bare chip 12 is arranged in the location on the ideal image surface (flat field not curving) f2 which touches on the image formation side f1 and the optical axis of the image formation lens 4 (the die length of the leg 11 is set up so that it may become such arrangement relation).

[0051] However, if it remains as it is, it will focus in near the center of an image pick-up side (neighborhood of a point which the image formation side f1 and the ideal image surface f2 touch), but the amount of defocusing from the focus location image pick-up side (ideal image surface f2) of the image formation side f1 becomes large, so that it separates from the center of an image pick-up side (so that it separates from the point that the image formation side f1 and the ideal image surface f2 touch, in the vertical direction in drawing 9). That is, although the image of the center section on an image pick-up side turns into a clear image which the focus suited, compared with it, the image of a periphery turns into the so-called image of pin dotage.

[0052] Then, in the whole image pick-up side, the image formation lens 4 is designed so that the uniform amount of defocusing may be obtained, and spherical aberration may arise on the optical axis of the image formation lens 4. the light which should converge essentially by this [near the contact of the image formation side f1 and the ideal image surface f2] as shown in drawing 9 (A) (if spherical aberration has not occurred) -- the location -- for example, it comes to converge in a more distant location. Consequently, also in the center section of the image pick-up side, it will be in the condition of pin dotage a little [so-called], and the image of an almost uniform focal condition will be obtained in the whole image pick-up side after all.

[0053] Namely, thereby, as shown in drawing 9 (B) and drawing 9 (D), it is made as [become / in a periphery (drawing 9 R> 9 (D)) / in the center section on the light-receiving side of the CCD bare chip 12 (drawing 9 (B)) / uniformly / the half-value width of a response of the image formation lens 4 to the point light source / larger than the pixel pitch of the CCD bare chip 12].

[0054] Here, drawing 9 (A) or drawing 9 (C) is carrying out the table of the condition of being

completed by the parallel ray to the center section or periphery of the CCD bare chip 12, respectively, and drawing 9 (B) or drawing 9 (D) expresses the luminous intensity (response to the point light source in infinite distance) on the light-receiving side of the CCD bare chip 12 at the time of being shown in drawing 9 (A) or drawing 9 (C). In this example, half-value width w1 or w2 of the point light source response in each center section or periphery of the CCD bare chip 12 is made twice [about] (preferably for example, 1.8 times thru/or about 3 times) the pixel pitch of the CCD bare chip 12 by each (the same is said of the location of others of the light-receiving side of the CCD bare chip 12). Thereby, as a CCD bare chip 12, the component of the number of low pixels whose horizontal direction is 360 pixels, whose perpendicular direction is 480 pixels and which is about 170,000 pixels can be used.

[0055] Thus, by making half-value width of a point light source response into twice the pixel pitch of the CCD bare chip 12, the spatial frequency response property of the image formation lens 4 is enough in the incidence component more than the spacial frequency fn of the nyquist limitation of the CCD bare chip 12, as shown in drawing 10 . It becomes the property to oppress. Therefore, although the optics LPF 112 for reducing clinch distortion was required as drawing 52 explained conventionally, clinch distortion can be reduced with the image pick-up equipment of drawing 1 , without preparing such an optical element. Consequently, miniaturization [of equipment], lightweight-izing, and low cost-ization can be attained.

[0056] In addition, in drawing 9 , although it was made to make the light near the optical axis focus in the direction in which only a predetermined distance separates from the image formation lens 4 from the image formation side f1 (ideal image surface f2) of the image formation lens 4, this is possible for making it also make reverse focus in the direction approaching the image formation lens 4.

[0057] Moreover, in this example, the image formation lens 4 is made into what has a short focal distance (for example, about 4mm), and let it be what has the small hole 3 which functions as drawing further (for example, the diameter, about 1.2mm thing). The degree of dotage becomes small, even if depth of field become deep and the distance to a photographic subject changes by this. Moreover, it is necessary to cease to prepare focal devices, such as the so-called autofocus device, in this image pick-up equipment, for example, and miniaturization [of equipment], lightweight-izing, and low cost-ization is attained also at this point. In addition, in carrying out image pick-up equipment to looking far, as an image formation lens 4, to use what has a long focal distance, and what is necessary is just made to let a hole 3 be a still smaller thing.

[0058] When the relation between the above image formation side and an image pick-up side is summarized, it comes to be shown in drawing 11 . That is, although the image formation side f1 of the image formation lens 4 curves to the ideal image surface f2, it means that it had arranged the image pick-up side 203 of the CCD bare chip 12 on this ideal image surface f2 in the above-mentioned example.

[0059] However, if it does in this way, since the amount of defocusing of a periphery will become large compared with the center section of the image pick-up side 203, the image on [whole] the image pick-up side 203 is made to become the image of a uniform focus by generating spherical aberration in a center section, as mentioned above.

[0060] However, in the case of this example, compared with a center section, there is an inclination for the amount of defocusing in a periphery to become large too much.

[0061] then -- for example, it is shown in drawing 12 -- as -- the image formation side f1 of the image formation lens 4 -- the image pick-up side 203 of the CCD bare chip 12 can be mostly arranged in the center (horizontal center of drawing 12). If it does in this way, the amount of defocusing in a periphery and a center section will serve as a value with the almost same absolute value, although a direction is opposing. However, a focal condition [/ near the point A that the image pick-up side 203 and the image formation side f1 cross in this case] will become good compared with the focal condition in other locations. Then, [near / this / the point A], the image formation lens 4 can be designed so that much aberration may occur. If it does in this way, the image of an almost uniform focal condition can be obtained in the whole image pick-up side 203.

[0062] Next, according to the example shown in drawing 12 , the conditions for obtaining a uniform image are further explained to a detail in the whole image pick-up side 203.

[0063] If the horizontal die length (the die length of a long side) Lh of the effective pixel field of the

CCD bare chip 12 is set to 2.0mm and the vertical die length (the die length of a shorter side) Lv is now set to 1.5mm as shown in drawing 13 , the die length of the diagonal length Ld will be set to about 2.5mm.
[0064] If the focal distance f of the image formation lens 4 is set to 4.0mm, the field angle of the direction of a long side will be called for with about 28 degrees from a degree type.
The field angle of the direction of a long side = 2xatan (2.0/(2x4.0))
[0065] In addition, atan means an arc tangent function here.
[0066] Moreover, the f number (= f/D) specified with the focal distance f and pupil diameter D of the image formation lens 4 is set to 2.8.
[0067] The radius R of the curved image formation side f1 is equal to the inverse number of the PETTSU bar sum P. That is, the PETTSU bar sum P is expressed with a degree type. In addition, n expresses the refractive index of the image formation lens 4 here.
1/(nf) of P=sigma
[0068] Since the number of the image formation lenses 4 is one in now, the radius R of the image surface 201 of operation will be searched for from a degree type, if a refractive index n is set to 1.5.
R=1/P=nxf=1.5x4.0=6.0[0069] Now, as shown in drawing 13 , it considers making the range from the core of an effective pixel field to one half of 70% of the diagonal length Ld into homogeneity. It can ask for one half of locations [70% of] Lm of this core to the diagonal length Ld from a degree type.
Lm=0.7xLd/2=0.4375xLh=0.875mm[0070] As shown in drawing 14 , the point on the ideal image surface f2 where only distance Lm estranged the intersection of the optical axis of O and the image formation lens 4, and the ideal image surface f2 for the core of the image formation side f1 from S and Point S Q and the image formation side f1, When setting the intersection of T, a line 205, and an optical axis to U for an intersection with the line 205 of the location which only distance Zm separated from the ideal image surface f2 to the image formation lens 4 side, the include angle theta which consists of points T, O, and U is mostly approximated by atan (Lm/R). Therefore, the distance of Points O and U is found by the degree type, when setting the radius of the image formation side f1 to R (distance of Points O and T = distance of Points O and S).
Rxcos {atan (Lm/R)}
[0071] Therefore, the amount Zm of bows from the ideal image surface f2 of the image formation side f1 in the location of the point Q that the distance from the point S on the optical axis on the ideal image surface f2 is Lm (image quantity is Lm) can be calculated from a degree type as R= 0.6mm and Lm=0.875mm.
Zm=Rx(1-cos{atan(Lm/R)}) =0.0628mm[0072] Now, in the center section of the screen the thing which arranges the image pick-up side 203 from the ideal image surface f2 to the image formation lens 4 side in the location of Zm/2, then near the trailer of a screen (location of the image quantity Lm), focal gap of Zm/2 occurs, respectively. It can ask for the diameter alpha of circle of confusion generated by this focal gap from a degree type from the relation of F=f/D=(Zm/2)/alpha.
alpha= (Zm/2) / F= 0.0314/Fmm [0073] Furthermore, MTF by circle opening can be calculated from a degree type.
M(omega) = [J1 {pialpha (k/Lh)}] /{pialpha (k/Lh)}
[0074] Here, J1 expresses the primary 1st sort Bessel function, and k/Lh expresses horizontal spatial frequency. Therefore, k corresponds to the number which divides the horizontal die length Lh. In addition, since the vertical solution characteristic of image is determined by the scanning line of television systems, it considers only horizontally here.
[0075] Since a value in case primary 1st sort Bessel function J1 is set to 0 to the beginning is 3.83, a degree type is materialized.
pialpha(k/Lh) =3.83[0076] Therefore, it is as follows when it asks for the trap point fn (= k/Lh) of MTF shown in drawing 10 from the above-mentioned formula.
(k/Lh) =3.83/(pialpha) =38.8F[0077] Therefore, it can ask for k as follows.
k=38.8xFxLh=38.8x2xF=77.6F[0078] Therefore, although the above-mentioned spatial frequency is secured, according to a sampling theorem, it can ask for the required number G of the minimum pixels from a degree type.
G=2k=2x77.6F=155F[0079] In addition, although the above-mentioned operation asks for the refractive

index n of the image formation lens 4 as 1.5, a higher value (for example, 1.9), then a degree type are obtained.
G=2k=200F[0080] That is, it becomes the conditions for obtaining a uniform image that the effective pixel pitch of the CCD bare chip 12 is larger than 1/(200F) of the long side of a service area. This means that the horizontal number of effective pixels is smaller than 200F, if it puts in another way.
[0081] In addition, in drawing 14 , the line which connects Point T to the edge of opening of the image formation lens 4 can ask for the path alpha of circle of confusion as a distance of the point which intersects the image pick-up side 203.
[0082] Therefore, as typically shown in drawing 15 , the pitch PP of the pixel 211 of the image pick-up side of the CCD bare chip 12 shown in drawing 3 R> 3 is formed so that the above-mentioned conditions may be satisfied.
[0083] Next, the conditions of the focal distance f for picturizing the photographic subject of the distance from the nearest distance S to infinity (infinity) using one image formation lens 4, as pin dotage decreases as much as possible are explained. If the amount of gaps of an image formation location with the image formation lens 4 of the photographic subject of infinite distance and an image formation location with the image formation lens 4 of the photographic subject of the near distance S is now set to g as shown in drawing 16 , a degree type will be materialized from the formula of image formation.
gx(S-f) =f2[0084] A degree type will be obtained if a top type is arranged using distance S being larger than a focal distance f enough.
g=f2/(S-f) =f2/S[0085] What is necessary is just to set the image pick-up side 203 of the CCD bare chip 12 as the midpoint (g/2 of locations) of the amount g of gaps in the range of this amount g of gaps, in order to, lessen the focal amount of gaps on the whole.
[0086] Like the case in drawing 13 , when setting the radius of Lh and a curvature of field to R (=nxf), the amount Z of bows of the image surface in the image quantity L can ask for the long side of the screen of an image sensor from a degree type.
Z=Rx(1-R2-L2) 1/2 -- here, since L2/R2 are smaller than 1 enough, the above-mentioned formula can be arranged as follows.
Z=Rx (1- (1-L2/(2xR2)))
= L2/(2xR) =L2/(2xnxf)
[0087] Since a correlation does not exist between g/2 and Z, the square of the synthetic amount D of focus gaps can be expressed as those sums of squares, as shown in a degree type.
D2=(g/2)2+Z2=(f2/2xS)2+(L2/(2xnxf))2=(f4/4xS2)+L4/(4xn2xf2)
[0088] A degree type will be obtained, if the formula which differentiated the above D2 by f is set with 0 in order to ask for f which gives the minimal value of D2 obtained by the above-mentioned formula.
f3/S2-L4/(2xn2xf3) =0[0089] This formula is solved and a degree type is obtained.
f= (/(2xn2)) (1/6) (S2xL4) [0090] That is, although what is necessary is just to obtain the focal distance f given by the above-mentioned formula with the image formation lens 4, even if it does not set it as the value strictly given by the above-mentioned formula, it is possible to give a certain width of face.
[0091] Namely, what is necessary is just to set the image quantity L to one one half of 0.35 times of die length of diagonal length thru/or 0.5 times the die length of this, in order to make it pin dotage not produce this range in homogeneity by the image generally, since important one is from the core of a screen to one half of 70 percent of the diagonal length of a screen. If the aspect ratio of a screen is set to 4:3, since one half of the die length of diagonal length will serve as x(5/8) Lh, what is necessary will be just to set the image quantity L as the next range.
0.35x(5/8) xLh=0.219 Lh<L<0.5x(5/8) xLh=0.312Lh[0092] Moreover, when the application to a television conference etc. is taken into consideration, the above-mentioned point-blank range S should just be 200mm thru/or 300mm. Furthermore, the refractive indexes n of the image formation lens 4 are n= 1.4 thru/or 1.9. A degree type will be obtained, if these conditions are substituted for the formula of the above-mentioned focal distance f and are arranged.
1.53x(Lh (2/3)) <f<2.46xLh(2/3) [0093] That is, if the focal distance f of one image formation lens 4 is set as the range specified by the above-mentioned formula, it can picturize, without carrying out pin dotage of the photographic subject which exists in infinite distance from point-blank range S.
[0094] Drawing 17 expresses the example of count of the square root (D2) (1/2) (axis of ordinate) of the

square of a focal distance f (axis of abscissa) and the synthetic amount D of focus gaps. In this case, it is referred to as L= 0.63mm, S= 200mm, and n= 1.5.
[0095] That is, in this example, when a focal distance f is set as about 4mm, it turns out that there are few amounts of focus gaps.
[0096] Next, with reference to drawing 18 and drawing 19 , the manufacture approach of the image pick-up equipment shown in drawing 1 R> 1 and drawing 3 is explained. First, as shown in drawing 18 , on a substrate 1, the CCD bare chip 12 and a pan are equipped with other chips if needed, and it connects with them electrically if needed. In this example, it is equipped with a driver 13, A/D converter 14, a timing generator 15, memory (2 port memory) 16, and a digital disposal circuit 17 as other chips. Furthermore, the lead 5 required for a substrate 1 is established, and electric connection with the chip with which it was equipped on the substrate 1 is made if needed.
[0097] On the other hand, as shown in drawing 19 , using the ingredient of protection-from-light nature, or the ingredient of transparence, mould shaping of package 2A or the lens section 10 which formed the hole 3 is carried out, respectively, into the part of the hole 3 of package 2A, the lens section 10 is unified by fitting in, and a holder 2 is manufactured.
[0098] And it unifies by being filled up with a bulking agent 20 as shown in drawing 3 where the leg 11 of the lens section 10 is dashed for a substrate 1 and a holder 2 against the CCD bare chip 12.
[0099] Since it is not necessary to carry out special adjustment in case a substrate 1 and a holder 2 are unified as mentioned above, image pick-up equipment can be manufactured by easy and low cost.
[0100] In addition, in the above-mentioned case, after carrying out mould shaping of package 2A or the lens section 10 according to, respectively, the holder 2 was manufactured by unifying these, but as shown in drawing 20 , a holder 2 can also manufacture package 2A and the lens section 10 by carrying out mould shaping simultaneously using the ingredient of protection-from-light nature, and the ingredient of transparence. Furthermore, as shown in drawing 21 in this case, the leg 11 of the lens section 10 can be constituted not using the ingredient of transparence but using the ingredient of protection-from-light nature. In this case, it becomes possible to be able to prevent the echo of the light in the leg 11, consequently to reduce the flare.
[0101] Drawing 22 expresses the example of an electric configuration of the video camera which applied the image pick-up equipment of drawing 1 . Incidence of the light from a photographic subject is carried out to the image formation lens 4 through a hole 3, and the image formation lens 4 is made as [make / the light-receiving side of the CCD bare chip 12 / carry out image formation of the light]. The CCD bare chip 12 is made as [operate / according to various kinds of timing signals yv, yh, and ys supplied from a driver 13], carries out photo electric translation of the light by which image formation was carried out with the image formation lens 4, and is made as [output / to the cds processing circuit (correlation duplex sampling processing circuit) 21 / the picture signal acquired as a result]. A driver 13 is changing an impedance and is taken as timing signals yv, yh, and ys while it changes the level for timing ** xv, xh, and xs for driving the CCD bare chip 12 supplied from a timing generator 15. And it is made as [drive / the CCD bare chip 12] by giving this to the CCD bare chip 12.
[0102] According to the sampling clock pa supplied from a timing generator 15, A/D converter 14 samples the picture signal from the cds processing circuit 21, and is made as [output / a picture signal / this / to memory 16 and an accumulator 22 / as digital image data]. In addition, A/D converter 14 is made as [determine / on the basis of the reference electrical potential difference vref supplied from the outside / the bit assigned to a sampled value]. The timing generator 15 is made as [generate / various kinds of timing signals] based on the clock supplied from the external clock generation circuit 31. Namely, the timing signals xv or xh for a timing generator 15 to transmit vertically or horizontally the charge generated with the CCD bare chip 12, respectively, In order to carry out the discharge of the charge generated with the CCD bare chip 12 (it discharges to the substrate of the CCD bare chip 12) A timing signal xs (the so-called shutter pulse), The sampling clock pa for [in timing signal sh for operating the cds processing circuit 21, and A/D converter 14] giving the timing of a sampling, And it is made as [generate / timing signal w for giving the timing of the writing of the image data in memory 16].
[0103] Memory 16 is made as [memorize / read-out and the writing of data / according to timing signal w to which it is possible 2 port memory simultaneously, and the image data from A/D converter 14 is

supplied from a timing generator 15]. The image data memorized by memory 16 is made as [carry out / by external MPU (microprocessor unit)32 / reading appearance]. in addition, the reading appearance of the image data from memory 16 based on MPU32 -- carrying out -- when MPU32 gives the predetermined address to memory 16 through an address bus adrs, the image data memorized to the address is outputted on a data bus data, and it is made as [carry / when MPU32 incorporates this].
[0104] the cds processing circuit 21 is made as [operate / according to the timing signal sh supplied from a timing generator 15] -- having -- **** -- the picture signal from the CCD bare chip 12 -- receiving -- the so-called correlation duplex sampling (correlative double sampling) place ** and other required processings are performed, the noise component contained in a picture signal by this is reduced (or -- removing), and it is made as [output / to A/D converter 14].
[0105] Although an accumulator 22 corresponds to the bodies (a part for for example, a core etc.) of the light-receiving side of the CCD bare chip 12 among the image data outputted from A/D converter 14, it calculates an integrated value, and it is made as [output / to a timing generator 15]. The timing generator 15 is made as [control / the timing signal for carrying out the discharge of the charge generated with the CCD bare chip 12, i.e., the timing of the shutter pulse xs,], and is made as [perform / electronically / by this / adjustment of an iris] so that the integrated value supplied from an accumulator 22 may not shift from predetermined default value greatly. That is, if an integrated value becomes large, the exposure time (charge storage time) will be shortened, and the exposure time will be lengthened if an integrated value becomes small. In addition, the accumulator 22 is made as [reset / with a field period (depending on the case, it is a frame period)]. Therefore, from an accumulator 22, the integrated value of the image data of every 1 field (or one frame) is outputted.
[0106] Through the lead 5, it connects with the timing generator 15, and the clock generation circuit 31 generates the clock for operating a video camera, and is made as [supply / a timing generator 15]. Through the address bus adrs or the data bus data, and the lead 5, MPU32 reads image data from image pick-up equipment (memory 16), and is made as [perform / predetermined signal processing].
[0107] Moreover, from the exterior, it is made as [supply / the electrical potential difference Vh for driving the electrical potential difference Vd used as the power source of each chip, the predetermined reference voltage gnd as a gland, and the CCD bare chip 12 through lead 5].
[0108] In addition, the cds processing circuit 21 and an accumulator 22 are equivalent to the digital disposal circuit 17 of drawing 18 .
[0109] Next, the actuation is explained. Incidence of the light from a photographic subject is carried out to the image formation lens 4 through the hole 3 which functions as fixed drawing, and image formation of this light is carried out on the light-receiving side of the CCD bare chip 12 with the image formation lens 4.
[0110] Here, drawing 23 shows the condition by which outgoing radiation was carried out from the image formation lens 4 that the light L of the outside for an image pick-up was reflected in respect of the near side of the leg 11. As mentioned above, the two side faces have countered with the optical axis of the image formation lens 4, and since the cross section is a rectangle, the include angle a of the part of the angle which consists of the two fields is still more nearly right-angled [the leg 11]. Therefore, as shown in this drawing, when the light L of the outside for an image pick-up is reflected on the side face of the leg 11, the reflected light does not arrive at the light-receiving side of the CCD bare chip 12. Therefore, there is almost no increment in the flare by the leg 11 being formed.
[0111] In addition, an include angle a may be an acute angle besides a right angle. However, in drawing 23 , if an include angle a is used as an obtuse angle, since the light reflected in respect of the near side of the leg 11 comes to carry out incidence to the CCD bare chip 12 side gradually, it is not desirable.
[0112] Moreover, it is possible to apply the coating of for example, protection-from-light nature to the leg 11, and to make it not make the light which carried out incidence there reach the CCD bare chip 12, either. Furthermore, the configuration of the cross section of the leg 11 can also be made squares other than a rectangle or a triangle, a pentagon, etc. However, the include angle of the part of the angle which at least one adjoining side face constitutes among the side faces of the leg 11 is used as a right angle or an acute angle, and it is necessary to make it the part of the angle counter with the optical axis of the image formation lens 4 for prevention of the increment in the flare.
[0113] With return and the CCD bare chip 12, photo electric translation of the light received there is

carried out, and the picture signal corresponding to the light is outputted to drawing 22 in the cds processing circuit 21 according to the timing signal from a driver 13. In the cds processing circuit 21, to the picture signal from the CCD bare chip 12, correlation duplex sampling processing is performed and it is outputted to A/D converter 14. In A/D converter 14, the picture signal from the cds processing circuit 21 is sampled, it considers as digital image data by this, and an accumulator 22 is supplied. In an accumulator 22, a predetermined thing which was mentioned above among the image data from A/D converter 14 is integrated, and the integrated value is outputted to a timing generator 15. If various kinds of timing signals are generated and an integrated value is supplied from an accumulator 22 based on the clock from the clock generation circuit 31, a timing generator 15 will change the generating timing of the shutter pulse xs so that the integrated value may not separate greatly from predetermined default value.

[0114] Moreover, the image data outputted from A/D converter 14 is supplied also to the memory 16 besides an accumulator 22, and is memorized. In MPU32, when required, reading appearance of the image data is carried out from memory 16, and predetermined processing is performed.

[0115] Photo electric translation is performed, and since the memory 16 which memorizes the output of A/D converter 14 which carries out A/D conversion of the output of the CCD bare chip 12 which outputs a picture signal, and the CCD bare chip 12, and A/D converter 14 is formed, when image pick-up equipment is seen from MPU32, in one package as image pick-up equipment, image pick-up equipment is equivalent to memory, therefore not conscious of the synchronous relation between image pick-up equipment and the block of the exterior in it. Consequently, when applying image pick-up equipment to a video camera which was mentioned above, or other equipments, the inclusion and handling can be performed easily.

[0116] In addition, it replaces with memory 16 and camera circuits, such as an NTSC encoder, are arranged, and image data is changed into the video signal of NTSC system, and you may make it output it.

[0117] In addition, in this example, although it considers as the optoelectric transducer which carries out photo electric translation of the light from the image formation lens 4 and the bare chip of CCD was used, it is also possible to use the bare chip of the destructive-reading mold image sensor which, in addition to this, reads the charge charged by capacitors, such as for example, a CMOS mold image sensor, as a picture signal as an optoelectric transducer. Furthermore, as an optoelectric transducer, it is also possible to use things other than a destructive-reading mold image sensor. To use optoelectric transducers other than CCD, it is necessary to cease to form the cds processing circuit 21.

[0118] Moreover, in this example, although memory 16 was used as 2 port memory, it is also possible to use the usual memory which is not such 2 port memory as memory 16. However, when memory 16 is not 2 port memory, the circuit for aiming at adjustment with read-out of the image data depended CPU32 and the writing of the image data based on A/D converter 14 is needed.

[0119] furthermore, in this example, although it was made to contact each of the four legs 11 of the lens section 10 on four squares of the CCD bare chip 12 directly, the thing of four sides (part which has attached ** mark in drawing 2) of the CCD bare chip 12 which it is alike, respectively, and is established for these four legs 11 so that it may be made to contact is possible. However, since the flare is produced and it is hard coming to pull out the path cord from the CCD bare chip 12 when the reflected light reflected by the leg 11 in this case carries out incidence to the CCD bare chip 12, as this example explained, it is desirable [the leg 11] to prepare so that four angles of the CCD bare chip 12 may be made to contact.

[0120] Or as shown in drawing 24 , it is also possible to hold the two sides which counter among the sides which set the leg 11 of the lens section 10 to two, and attached and showed ** mark in drawing 2 by notch 11A again. Furthermore, projection 11Aa shown in drawing 7 or drawing 8 or taper side 11Ab can also be prepared also in this case.

[0121] Moreover, in the example of drawing 3 , although it was made to unite the lens section 10 with package 2A (holder 2), as shown in drawing 25 , it is also possible to prepare a gap among both. In this case, a substrate 1 is equipped with the soffit of the leg 11 with a bulking agent 20. When doing in this way and a pressure is added from outside to a holder 2, that it is directly transmitted to the lens section 10 decreases, and it becomes possible to control breakage of the lens section 10. In the case of this

example, the location of drawing by the hole 3 separates with the image formation lens 4, but since the effectiveness of drawing is not so sensitive, it is almost satisfactory practically.
[0122] By the way, generally, compared with glass, coefficient of thermal expansion of synthetic resin is about 10 times larger, and the temperature change of a refractive index is large [synthetic resin] a 100 times as many abbreviation of glass as this. Consequently, when the image formation lens 4 was formed with synthetic resin and temperature changes, a focal distance changes and it becomes difficult to enable it to use it over a large temperature change, without establishing an adjustment device. Then, he is trying to establish this adjustment device substantially as follows in this example, for example.
[0123] That is, if temperature rises as shown in drawing 26 , the die length L11 of the leg 11 will become long. Moreover, between the refractive index n of a convex lens, and a focal distance f, the following formulas are materialized mostly.
f=K/(2(n-1))
In addition, K is a multiplier related to the curvature of the lens spherical surface here.
[0124] Therefore, if temperature becomes high, the focal distance f of the image formation lens 4 shown in drawing 26 will change.
[0125] Now, coefficient of linear expansion of a (the degree of /) and the leg 11 is set to b (the degree of /) for the refractive-index change to a unit temperature change. Usually, a of a resin lens is a negative value, the order is 10-5 thru/or 10-4, b is a forward value, and the order is 10-5 thru/or 10-4.
[0126] If temperature sets focal location change when only T (degree) goes up to deltaf in ordinary temperature now, focal location change deltaf can be expressed as follows.
deltaf=K/(2 (n-1+axT))-R/(2 (n-1))
= -axTxK/(2(n-1+axT) x (n-1))
= -axTxf/(n-1+axT)
[0127] However, it is R=2x(n-1) xf.
[0128] Usually, since n-1 >>axT is materialized, the above-mentioned formula can be expressed as follows.
deltaf=-axTxf/(n-1)
[0129] Moreover, temperature can express augend deltaL of the die length L11 of the leg 11 with a degree type, when only T goes up.
deltaL=bxTxL11 [0130] Therefore, actual movement magnitude deltah of a focal distance side is as follows.
deltah=deltaf-deltaL [0131] then, designing so that deltah may be settled in depth of focus deltaZ of the image formation lens 4, i.e., degree type |-axf/(n-1)-bxL11|, -- < (deltaZ/T) --
Even if temperature changes by designing so that it may be satisfied, it becomes possible to locate the focus location f1 on the light-receiving side of the CCD bare chip 12.
[0132] Moreover, he restricts the spatial frequency of an incident light image using the aberration of a lens etc., and is trying to reduce clinch distortion generated on the CCD bare chip 12 in the above-mentioned example. However, it is required that the color moire generated with a veneer color camera depending on the application of a camera should fully be oppressed. In this case, although it is necessary to oppress only specific spatial frequency keenly, it is difficult to oppress only specific spatial frequency keenly by the spatial-frequency restricting method like the above-mentioned example.
[0133] As shown in drawing 27 , the image formation lens 4 is divided into two in the level surface passing through the core, and it considers as the image formation lenses 4A and 4B, and only an include angle theta can rotate image formation lens 4A horizontally to image formation lens 4B on the parting plane, and the lens of a configuration of having formed surface-of-discontinuity 4C can be used there. This image formation lens 4 comes to be shown in drawing 28 seen from a top face.
[0134] In this case, after the light from a photographic subject penetrates upper image formation lens 4A, it is horizontally separated from the location which carries out image formation to the CCD bare chip 12, and the location which penetrates downward image formation lens 4B, and carries out image formation on the CCD bare chip 12 of distance Q. Namely, a degree type is materialized at this time.
theta=2xatan (Q/2f)
[0135] Consequently, MTF with these image formation lenses 4A and 4B comes to be shown in drawing 29 , and serves as the property that spatial frequency falls keenly in 1/(2Q).

[0136] in addition, in order to acquire such a property, it is not necessary to necessarily make horizontal the direction of the surface of discontinuity of the image formation lens 4, and is shown in drawing 30 -- as -- a perpendicular direction (drawing 30 (A)) or the direction of slant (drawing 30 (B)) -- even if -- it is good.
[0137] Furthermore, in the above-mentioned example, although the leg 11 of the lens section 10 was made to contact directly on the CCD bare chip 12, it is possible to make it also make it contact on a substrate 1. Drawing 31 expresses the example in this case.
[0138] That is, in the example of drawing 31 , crevice 1A of a larger configuration a little than the CCD bare chip 12 is formed in the substrate 1. And the CCD bare chip 12 is pasted up on this crevice 1A with the bulking agent 20, and, as for the leg 11 of the lens section 10, that notch 11A is stopped by the corner of crevice 1A of a substrate 1. And the periphery of the leg 11 is pasted up on the substrate 1 with the bulking agent 20. Other configurations are the same as that of the case in drawing 3 .
[0139] Drawing 32 expresses the process for attaching the CCD bare chip 12 and the lens section 10 in an example of drawing 31 in a substrate 1.
[0140] That is, first, as shown in drawing 32 (A), the image pick-up side of the CCD bare chip 12 is adsorbed with the fixture 501 for holding IC chip of an adsorption mold. And as shown in drawing 32 (B), the bulking agent 20 is beforehand applied to crevice 1A of a substrate 1, and as shown in drawing 32 (C), die bonding of the CCD bare chip 12 currently held at the fixture 501 is carried out into crevice 1A of a substrate 1. At this time, top-face 1B of a substrate 1 and field 501A of a fixture 501 contact, and the image pick-up side of the CCD bare chip 12 is positioned by the same height as top-face 1B of a substrate 1.
[0141] Next, as shown in drawing 32 (D), notch 11A of the lens section 10 is engaged with the corner formed by forming crevice 1A of a substrate 1. And as further shown in drawing 32 (E), it is filled up with a bulking agent 20 between the periphery of the leg 11, and the top face of a substrate 1, and pastes up.
[0142] In addition, although it is possible to position the height of the image pick-up side of the CCD bare chip 12 to accuracy since die bonding of the CCD bare chip 12 is carried out into crevice 1A in the case of this example, the installation precision within the level surface (inside of XY flat surface) falls a little. However, since the leg 11 of the lens section 10 can be arranged in the location distant from the image pick-up side of the CCD bare chip 12, even if there is a bonding wire (not shown) of the CCD bare chip 12, this can be avoided easily and the lens section 10 can be attached. Moreover, the effect by the defect echo in the leg 11 is mitigable.
[0143] Furthermore, it considers as the leg of the core box configuration by which the field of a four way type as shows the leg 11 of the lens section 10 to drawing 33 is surrounded, for example, and can prevent that dust etc. advances into the interior. Moreover, at this time, as shown in drawing 33 , projection 11Aa can be prepared in the base of the leg 11. Or as shown in drawing 34 , it is good again also as a configuration which prepares the two legs which counter. And projection 11Aa on a cylinder can be formed in the base of the leg 11 in this case.
[0144] Drawing 35 shows other examples of a configuration of the image pick-up equipment shown in drawing 22 . That is, in this example, while the clock generation circuit 31 in drawing 22 is held in the interior of image pick-up equipment, the camera processing circuit 511 is formed instead of memory 16, and the output of A/D converter 14 is supplied. And in the camera processing circuit 511, a luminance signal, a color-difference signal or R and G, B signal, etc. are generated. Furthermore, an encoder is made to build in here, for example, you may make it make it change into the video data of a format of NTSC system. Once the output is supplied to FIFO memory 512 and memorized, reading appearance of it is carried out to predetermined timing. It is inputted into the parallel serial (P/S) transducer 513, parallel data are changed into serial data, and the data by which reading appearance was carried out from FIFO memory 512 are outputted as the data of a non-inverter, and data of an opposite phase from an output terminal 517 through a driver 515.
[0145] On the other hand, the data of the non-inverter inputted from the input terminal 518 and an opposite phase are inputted into the mediation circuit 514 after an inphase component is removed by the receiver 516. Corresponding to the inputted control data, the mediation circuit 514 controls FIFO memory 512, writes in the data from the camera processing circuit 511, controls a driver 515 and makes

the data from the parallel serial conversion machine 513 output while it performs control read to predetermined timing.
[0146] This driver 515 and receiver 516 are based on the standard of the serial bus specified to IEEE1394. It is also possible to make it based on USD in addition to this.
[0147] Thus, it can prevent that image pick-up equipment is enlarged with constituting so that data may be outputted serially and an input may be received compared with the case where parallel data are outputted and inputted.
[0148] In addition, from A/D converter 14, since actuation of the preceding paragraph is the same as that of the case in drawing 22 , the explanation is omitted.
[0149] [2nd example] drawing 36 is the perspective view showing the configuration of the 2nd example of the image pick-up equipment which applied this invention. They are unified and constituted by equipping a substrate 51 with a holder (package) 52 (fitting) like [this image pick-up equipment] the image pick-up equipment of the 1st example. In order to attain miniaturization, lightweight-izing, and low-pricing further from the image pick-up equipment of the 1st example, this image pick-up equipment however, to a holder 52 As that part, one image formation lens 54 for carrying out image formation of the light is formed in the upper part (therefore, this holder 52). Moreover it is equivalent to the lens section 10 in the 1st example, photo electric translation of the light by which image formation was carried out with the image formation lens 54 is carried out to a substrate 51, and it is equipped only with the CCD bare chip 12 (drawing 37 thru/or drawing 39) which outputs a picture signal. In addition, a holder 52 becomes with the ingredients (for example, transparent plastics (for example, PMMA etc.) etc.) of transparence, and the light-shielding film 61 of the protection-from-light nature which has the drawing effectiveness which intercepts such a marginal ray is formed in the sheathing part except the part of the image formation lens 54 so that the marginal ray which is not so important may not carry out incidence to the CCD bare chip 12 (coating). Moreover, the CCD bare chip 12 is the same as that of the case in the 1st example.
[0150] Drawing 37 is the top view of the image pick-up equipment of drawing 36 , and drawing 38 or drawing 39 is the sectional view of a B-B'part or C-C' part in drawing 36 , respectively. On the substrate 51, as mentioned above, it is equipped only with the CCD bare chip 12. In addition, when a substrate 51 is equipped with a holder 52, the image formation lens 54 currently formed as a part of holder 52 and a location which counters are equipped with the CCD bare chip 12.
[0151] Furthermore, the lead 55 for outputting a signal to the exterior and inputting a signal from the exterior like a substrate 1, is formed in the side face of a substrate 51. In addition, the graphic display of lead 55 is omitted in drawing 36 , drawing 38 , and drawing 39 .
[0152] From the CCD bare chip 12 with which the substrate 51 was equipped, path cord 12A for transfer of a signal is pulled out, and each path cord 12A is connected with the predetermined lead 55.
[0153] A holder 52 becomes with a transparent ingredient, as mentioned above, and let the configuration be the core box the horizontal cross section of whose is a rectangle (when the upper and lower sides are made into reverse in the condition which shows in drawing 38). And the image formation lens 54 as a single ball lens is formed in a part for the core of the base (upper part of image pick-up equipment), and nonreflective coatings also including the inside are made except for the part of the image formation lens 54. That is, processing which the coating of protection-from-light nature is applied, or applies to this is made by the holder 52, and, thereby, the light-shielding film 61 is formed in it.
[0154] Now, as shown in drawing 37 , outgoing-line 12A twists the die length of the side (it sets to drawing 3737 and is the vertical side) of the direction where path cord 12A of the CCD bare chip 12 is pulled out, and it is longer than the die length of the side (it sets to drawing 37 and is the horizontal side) of the direction. Therefore, in drawing 37 , it is horizontal among 2 sets of legs 62 which are four side faces of a holder 52 and which counter, the distance of leg 62 which counter will become short as shown in drawing 38 , and the distance of leg 62 which are perpendicular in drawing 37 and counter will become long as shown in drawing 39 . And as for the leg 62 which one side counters, notch 62A is formed for the inside part of ********** and this. And the part of this notch 62A is made as [fit in / with a precision sufficient into the part of two sides of the length of the CCD bare chip 12].
[0155] In addition, in this example, it consists of carrying out mould shaping of the transparent plastics (therefore, the image formation lens 54 is also a plastics mould single ball lens as well as the image

formation lens 4), and, thereby, the holder 52 is made high enough for a relative precision of the dimension of each part of a holder 52 to the principal point of the image formation lens 54.
[0156] The leg 62 which one side of a holder 52 counters touches the CCD bare chip 12 directly by carrying out fitting to the part of two sides of length [in / respectively / drawing 37 of the CCD bare chip 12] of the part of the notch 62A. The die length (the die length of the perpendicular direction in drawing 38) of the leg 62 which one of these counters is made how many minutes shorter than the die length (the die length of the perpendicular direction in drawing 3939) of the leg 62 which another side counters. After the soffit of the leg 62 where on the other hand (drawing 38) counters has floated a little from the substrate 51 by this, notch 62A has a certain amount of pressure in the light-receiving side and side face of the CCD bare chip 12, and touches directly (therefore, the leg [on the other hand / (drawing 38)] 62 is made into the condition of having been dashed by the CCD bare chip 12). In addition, this pressure is made as [generate / by pasting up and closing a substrate 51 and a holder 52] by being filled up with a bulking agent 20, putting a predetermined pressure, after fitting a holder 52 into a substrate 51.

[0157] Although the leg 62 which another side (drawing 39) of a holder 52 counters is how many minutes longer than the leg 62 which on the other hand (drawing 38) counters, when notch 62A is dashed against the light-receiving side of the CCD bare chip 12, let the lower part be the die length of extent which does not contact a substrate 51. Therefore, the substrate 51 and the holder 52 are pasted up in the form which gives priority to the precision which contacts the leg 62 which on the other hand (drawing 38) counters to the CCD bare chip 12.
[0158] In addition, the dimension (die length) of the two legs (leg which on the other hand (drawing 38) counters) 62 dashed by the optical property and the CCD bare chip 12 of the image formation lens 54 is made like the case where drawing 11 or drawing 12 explains.
[0159] As mentioned above, also in this example, since it was made to unify the substrate 51 with which it was equipped with the CCD bare chip 12, and the holder 52 with which the light-shielding film 61 which has the image formation lens 54 and the drawing effectiveness was formed, the inclusion and handling at the time of application of image pick-up equipment become easy, and become possible [reducing a manufacturing cost].
[0160] While relative precision over the principal point of the image formation lens 54 of the dimension of each part of a holder 52 is made high enough, furthermore, the leg 62 which on the other hand (drawing 38) counters Since it is directly dashed against the light-receiving side of the CCD bare chip 12, like the case in the image formation lens 4 of the 1st example, without carrying out special adjustment, the image formation lens 54 can be arranged with a sufficient precision, and, thereby, can attain miniaturization of image pick-up equipment, and lightweight-ization.
[0161] Moreover, to a holder 52, since the image formation lens 54 is formed and the substrate 51 was equipped only with the CCD bare chip 12 as the part, as compared with the case in the 1st example, further miniaturization of image pick-up equipment, lightweight-izing, and low-pricing can be attained.
[0162] Furthermore, as shown in drawing 39 , since distance of leg 62 which another side of a holder 52 counters is made longer than the horizontal die length in drawing 37 of the CCD bare chip 12, it can take about path cord 12A easily.
[0163] Next, the manufacture approach of the image pick-up equipment shown in drawing 36 thru/or drawing 39 is explained. First, while equipping with the CCD bare chip 12 on a substrate 51, lead 55 is established and connection between path cord 12A of the CCD bare chip 12 and lead 55 is made if needed. On the other hand, it has the image formation lens 54 using the ingredient of transparence, and after carrying out mould shaping of the holder 52 which prepared notch 62A in the leg 62, a light-shielding film 61 is formed. And it unifies by being filled up with a bulking agent 20 as shown in drawing 38 and drawing 39 where the leg 62 which one side counters in a substrate 51 and a holder 52 is dashed against the CCD bare chip 12.
[0164] In case a substrate 51 and a holder 52 are unified, since it is not necessary to carry out special adjustment, image pick-up equipment can be manufactured by easy and low cost like the case of the 1st example.
[0165] In addition, mould shaping of the holder 52 (image formation lens 54) can be carried out also in this case using the ingredient of transparence, and the ingredient of protection-from-light nature.

Thereby, as shown in drawing 40 , the image formation lens 54 can be formed by the transparent material, and the leg 62 can be formed with a protection-from-light nature ingredient.
[0166] Or the image formation lens 54 is fabricated by the transparent material including the leg 62, and as the outside sheet 91 and the inner sheet 92 are put, respectively, you may make it form a holder 52 in a periphery and inner circumference side again, as shown in drawing 41 . The outside [this] sheet 91 and the inner sheet 92 are protection-from-light nature ingredients, respectively, and are formed corresponding to the configuration by the side of the periphery of the image formation lens 54, and inner circumference. Or you may make it paint black instead of putting the outside sheet 91 and the inner sheet 92.
[0167] In addition to this, as shown in drawing 42 , the mould of the periphery of a substrate 51 and the image formation lens 54 can be carried out by black resin 66 by the condition of having equipped with the CCD bare chip 12 on the substrate 51, and having equipped with the image formation lens 54 on the substrate 51 further.
[0168] Moreover, signal processing of the picture signal which drives from the exterior the signal outputted from the driver 13 which showed this image pick-up equipment to drawing 22 in inputting through lead 55, consequently is too acquired through lead 55 is carried out if needed outside.
[0169] Furthermore, as an optoelectric transducer, although it considers as the optoelectric transducer which carries out photo electric translation of the light from the image formation lens 54 and the CCD bare chip 12 was used, as the 1st example explained, it is possible in this example, to use the thing of a destructive-reading mold image sensor or others.
[0170] In addition, the substrate 51 in the example of drawing 39 is enlarged as [show / in drawing 43], and various kinds of components 67 can be arranged on the substrate 51.
[0171] Moreover, as an image formation lens, as shown not only in one step of configuration but in drawing 44 , it can also consider as two steps of configurations, image formation lens 54A (convex lens) and image formation lens 54B (concave lens). Of course, it is also possible to consider as three or more steps of configurations.
[0172] [3rd example] drawing 45 shows the example of a configuration of the video camera incorporating the image pick-up equipment 100 which applied this invention. In addition, about the case in drawing 22 , and the corresponding part, the same sign is attached among drawing. Image pick-up equipment 100 is constituted like the image pick-up equipment of the 1st example or the 2nd example. However, the substrate 1 (or 51) is equipped with the CCD bare chip 12 and A/D converter 70. In addition, image pick-up equipment 100 shall consist of this examples like the image pick-up equipment of the 1st example.
[0173] A/D converter 70 is an A/D converter of a serial output mold, and is made as [output / in the form of serial data / the digital image data which carries out A/D conversion of one half of the periods of the output period (time amount after the picture signal corresponding to a certain pixel is outputted, until the picture signal corresponding to the following pixel is outputted) to the timing of the sampling clock p1 which it has, and is obtained as a result in the picture signal outputted from the CCD bare chip 12].
[0174] In addition, A/D converter 70 is made as [determine / on the basis of the reference electrical potential difference vref supplied from the outside / the bit assigned to a sampled value].
[0175] Moreover, it is also possible to use the A/D converter of the parallel output mold which outputs the image data obtained as a result of the sampling in the form of parallel data as A/D converter 70 (the S/P converter 71 later mentioned in this case becomes unnecessary). However, when A/D converter 70 is used as the A/D converter of a serial output mold to establishing the lead 5 for the number of bits of the image data outputted in the form of parallel data as A/D converter 70 when the A/D converter of a parallel output mold is used, the lead 5 required since image data is outputted can be managed with one. Therefore, as A/D converter 70, the direction which used the thing of a serial output mold can constitute image pick-up equipment 100 small.
[0176] The S/P (serial/parallel) transducer 71 changes into the image data of parallel the serial image data outputted from image pick-up equipment 100 (A/D converter 70), and is made as [output / to D-FF (delayed type flip-flop)72 and a subtractor circuit 73]. D-FF72 is made as [output / according to the clock p2 which has the same period as a sampling clock p1, / the image data from the S/P transducer 71 / to a subtractor circuit 73 / it is delayed by one clock and]. a subtractor circuit 73 -- the difference of

the image data from the S/P transducer 71, and the output of D-FF72 -- calculating -- the difference -- it is made as [output / to D-FF74 / a value]. the difference outputted from a subtractor circuit 73 according to the clock p3 with which D-FF74 has a clock (the same period as the output period of a pixel) twice the period of p2 -- a value is latched alternately and it is made as [output / to the camera digital disposal circuit 75].

[0177] The camera digital disposal circuit 75 is made as [perform / to the output of D-FF74 / predetermined signal processing].

[0178] The timing generator 76 is made as [generate / various kinds of timing signals] based on the clock supplied from the clock generation circuit which is not illustrated. Namely, a timing generator 76 generates the timing signal for driving the CCD bare chip 12 like the timing generator 15 of drawing 22 , and supplies it to a driver 13. Furthermore, a timing generator 76 generates the clocks p1, p2, and p3 of a period which was mentioned above, and supplies them to A/D converter 70 and D-FF 72 and 73, respectively. Moreover, a timing generator 76 generates a clock required for the S/P converter 71 to operate, and supplies it to the S/P converter 71. In addition, as for various kinds of timing signals which a timing generator 76 outputs, the synchronization with mutual should be taken (it should synchronize with the clock from the clock generation circuit).

[0179] Next, the actuation is explained with reference to the timing chart of drawing 46 . Incidence of the light from a photographic subject is carried out to the image formation lens 4, and image formation of this light is carried out on the light-receiving side of the CCD bare chip 12 with the image formation lens 4. In the CCD bare chip 12, photo electric translation of the light received there is carried out, and the picture signal out corresponding to the light is outputted to A/D converter 70 according to the timing signal from a driver 13. Here, drawing 46 (A) shows the picture signal out outputted from the CCD bare chip 12.

[0180] With A/D converter 70, A/D conversion is carried out with the sampling clock p1 (drawing 46 R> 6 (B)) with which the picture signal out outputted from the CCD bare chip 12 has one half of the periods of the output period, for example, the timing of a rising edge, and the digital image data sa (drawing 46 (C)) obtained as a result is outputted to the S/P converter 71 in the form of serial data. In the S/P transducer 71, the serial image data sa from A/D converter 70 is changed into the image data sb (drawing 46 (E)) of parallel, and is outputted to D-FF72 and a subtractor circuit 73.

[0181] In addition, in the S/P transducer 71, transform processing takes the time amount for one clock, and, for this reason, image data sb (drawing 46 (E)) becomes that in which only one clock was behind [image data sa (drawing 46 (C))].

[0182] In D-FF72, the image data sb from the S/P transducer 71 is latched, this is delayed by the sampling clock p1 and the clock p2 (drawing 46 (D)) which has the same period supplied from a timing generator 76, for example, the timing of a rising edge, by one clock, and it considers as the image data sc as shown in drawing 46 (F), and is outputted to a subtractor circuit 73.

[0183] Here, since the clock p2 which has the same period as a sampling clock p1 has one half of the periods of the period to which the CCD bare chip 12 outputs a picture signal out, the image data sc delayed by one period of a clock p2 becomes that the phase was behind [that] only in the time amount corresponding to the one half of the pixel pitch of the CCD bare chip 12 from image data sb about image data sb. Then, image data sc is hereafter called suitably half-pixel lag data sc.

[0184] In a subtractor circuit 73, the half-pixel lag data sc outputted from D-FF72 is subtracted from the image data sb outputted from the S/P transducer 71, and the subtraction value (difference value) sd (drawing 46 (G)) is outputted to D-FF74. In D-FF74, the subtraction value sd from a subtractor circuit 73 is latched with the clock p3 (drawing 46 (H)) which has a clock twice the period of p2 supplied from a timing generator 76, for example, the timing of a rising edge, and, thereby, the image data se as shown in drawing 46 (I) is outputted to the camera digital disposal circuit 75. That is, in D-FF74, the subtraction value sd from a subtractor circuit 73 is latched alternately, and is outputted to the camera digital disposal circuit 75.

[0185] Here, drawing 47 shows the example of an internal configuration of the CCD bare chip 12 (example of a configuration of the so-called part of FDA (Floating Diffusion Amplifier)). The charge generated in respect of light-receiving of the CCD bare chip 12 is charged by Capacitor C (are recording), and, thereby, the electrical-potential-difference change corresponding to the charge

accumulated in Capacitor C is outputted as a picture signal from an output buffer BUF. And Switch SW is turned ON, by the forward electrical potential difference E being impressed to Capacitor C by this, the discharge of the capacitor C is carried out (charged by the reference potential), Switch SW is turned OFF after that, and Capacitor C will be in the condition which can charge the charge corresponding to the following pixel.

[0186] In the CCD bare chip 12, although a picture signal is outputted by the above actuation being repeated, in case Switch SW is switched on and turned off, thermal noise occurs and the electrical potential difference corresponding to the thermal noise is held by Capacitor C. Moreover, in an output buffer BUF, the so-called 1/f noise (noise of fluctuation) occurs. For this reason, after Switch SW was turned on and turned off further (actuation of such a switch SW) Hereafter an output level (the output level of the output buffer BUF after such reset is hereafter called precharge level suitably) of an output buffer BUF called reset suitably It is set to the level which did not turn into predetermined reference level (for example, black level etc.), but reflected the effect of thermal noise which was mentioned above, and a 1/f noise (henceforth [both are included and] a noise component).

[0187] Then, before performing A/D-conversion processing etc. to the output of the CCD bare chip 12, it is usually made as [acquire / the picture signal which reduced the noise component] by performing correlation duplex sampling processing in which it explained in the 1st example.

[0188] However, when it seems that he wants to miniaturize the image pick-up equipment 100 having the CCD bare chip 12 as much as possible, and to obtain digital image data as an output, the request of a miniaturization will be met in having made the cds processing circuit 21 where the output of the CCD bare chip 12 was shown in drawing 22 in order to carry out correlation duplex sampling processing build in image pick-up equipment 100.

[0189] So, in the video camera of drawing 45 , after making the output of the CCD bare chip 12 into image data digital with A/D converter 70 in order to respond to such a request, it is made as [reduce / as follows / a noise component].

[0190] That is, since the picture signal out outputted from the CCD bare chip 12 was mentioned above, as shown in drawing 46 (A), it consists of the precharge section (part shown by the dotted line among drawing) used as precharge level, and the signal section (part shown as a continuous line among drawing) used as the level (signal level) corresponding to the charge charged by Capacitor C. And there is functionality in the noise component contained in a certain signal section, and the noise component contained in the precharge section in front of that from the generating principle of an above-mentioned noise component. That is, the noise component contained in a certain signal section and the precharge level in front of that are almost equal. Therefore, if the precharge level in front of that is subtracted, the true signal component of the signal section will be obtained from the signal level of a certain signal section.

[0191] In D-FF72, a subtractor circuit 73, and D-FF74, it is made as [obtain / to the image data sa from A/D converter 70 / by performing processing corresponding to an above-mentioned principle / the image data which reduced the noise component].

[0192] That is, in A/D converter 70, since A/D conversion of the picture signal out from the CCD bare chip 12 is carried out to the timing of a sampling clock p1 (drawing 46 (B)) which has one half of the periods of the output period as mentioned above, the digital image data sa obtained as a result becomes that with which signal level (vi) and precharge level (fi) were located in a line by turns, as shown in drawing 46 (C). In addition, similarly, in signal level or precharge level, a figure is given to v or f, respectively, and) has shown drawing 46 (C) (drawing 46 (E) and drawing 4646 (F). Moreover, the same figure is given to the signal level and precharge level (a certain signal level and precharge level in front of that) which should become a group.

[0193] And since the image data sb or the half-pixel lag data sc inputted into a subtractor circuit 73 was delayed by one clock or two clocks, respectively, it came to have shown image data sa (however, thing changed into the form of parallel data) to drawing 46 (E) or drawing 46 (F). Furthermore, in a subtractor circuit 73, what was called for from the signal level and precharge level which should become a group among the subtraction value sd since the half-pixel lag data sb is subtracted serves as image data (suitably henceforth true image data) by which the noise component was reduced from image data sb. That is, the subtraction value sd serves as true image data alternately, as a figure is attached and shown

in v' in drawing 46 (G). In addition, in drawing 46 (G), v'#i (#i is an integer) expresses the result of an operation of v#i-f#i, and x expresses invalid data.
[0194] Therefore, in D-FF74, only the true image data se (drawing 46 (I)) will be supplied to the camera digital disposal circuit 75 by latching alternately to the timing of a clock p3 that it showed the subtraction value sd in drawing 46 (H).
[0195] In addition, according to the subtraction processing in a subtractor circuit 73, the effective number of bits is made to fall, but the effect by this can almost be disregarded by setting up appropriately the reference voltage vref given to A/D converter 70.
[0196] In the camera digital disposal circuit 75, image data se is changed into an analog signal as shown in drawing 46 (J), and it is recorded on a video tape etc.
[0197] As mentioned above, it is digital, and since image data is outputted, it becomes possible from image pick-up equipment 100 to constitute the equipment incorporating this easily.
[0198] Moreover, in A/D converter 70, since it was made to perform A/D conversion to the timing of a sampling clock p1 which has one half of the periods of the output period of the picture signal out from the CCD bare chip 12, the noise component contained in image data can be reduced easily after that. Consequently, the small image pick-up equipment which it becomes unnecessary to establish the circuit for reducing such a noise component in image pick-up equipment 100, and outputs digital image data to it is realizable.
[0199] The [4th example] It is possible to use it, equipping a personal computer with the above image pick-up equipments. Drawing 48 shows the appearance configuration of such a personal computer. That is, the keyboard 242 is formed in the top face by the side of the body 241 of the notebook type personal computer 240, and the FD applied part 244 and the PC card applied part 245 are formed in the side face of the body 241. When not equipping with and using PC card 246 for the PC card applied part 245 if needed, it is made as [take / this]. Moreover, LCD243 is supported free [rotation] to the body 241, and the predetermined alphabetic character, the graphic form, etc. are made as [display / image information].
[0200] Drawing 49 shows the appearance configuration of PC card 246. In this example, 85.6mm and width of face are set to 54.0mm, and, as for PC card 246, height (thickness) is set to 10.5mm for die length. This configuration is specified as a card of the standard type 3 for PCMCIA (personal computer memory card international association).
[0201] As shown in drawing 50 , this PC card 246 has the case 301, and is held free [a slide of the slide member 302] to this case 301. And image pick-up equipment 100 is supported by this slide member 302 free [rotation] through the supporter material 303. When the slide member 302 is made to advance into the interior of a case 301, it is made as [hold / image pick-up equipment 100 / in the interior of a case 301 / thoroughly].
[0202] And when connecting a personal computer 240 to communication lines, such as the telephone line, and, performing a TV phone and a television conference for example, as shown in drawing 50 , image pick-up equipment 100 is pulled out to the exterior of a personal computer 240 by equipping the PC card applied part 245 with PC card 246, and making the slide member 302 slide to a case 301. Furthermore, image pick-up equipment 100 is rotated in the range of about 60 degrees thru/or 90 degrees by using the supporter material 303 as the supporting point, and a user (photographic subject) is made to point to the hole 3 (image formation lens 4) of image pick-up equipment 100, as shown in drawing 51 .
[0203] Drawing 52 expresses the example of a configuration inside the image pick-up equipment 100 held in the case 301 of PC card 246 in this way, i.e., the 4th example.
[0204] This example is fundamentally considered as the same configuration as the 1st example shown in drawing 3 . However, the background (the image formation lens 4 and opposite hand) of a substrate 1 is equipped with the CCD bare chip 12 so that the light-receiving side (image pick-up side) (it sets to drawing 52 and is an upper field) may counter the image formation lens 4 through the hole 231 formed in the substrate 1 by the flip chip mounting method. The projection 233 is formed in the substrate 1 in order to regulate the location equipped with this CCD bare chip 12.
[0205] Moreover, the image formation lens 4 is attached in the drawing Nakagami side side (the field and opposite hand equipped with the CCD bare chip 12) of a substrate 1. The projection 232 is formed

in the substrate 1 in order to regulate the installation location of this image formation lens 4. The image formation lens 4 and the CCD bare chip 12 are made as [carry out / through the hole 231 of a substrate 1 / in a predetermined relative position / opposite arrangement] by considering projection 233 for the CCD bare chip 12 as a guide, and attaching installation and the image formation lens 4 in a position by considering projection 232 as a guide at a position.

[0206] Moreover, a driver 13 and A/D converter 14 are arranged and the other components 234 are attached in the top face of a substrate 1 at the underside side of a substrate 1.

[0207] The hole 3 which functions as drawing is formed in the position of package 2A, and when this package 2A is pasted up on a substrate 1 through a bulking agent 20, incidence of the light by which incidence was carried out through the hole 3 is carried out to the image formation lens 4. It is condensed with the image formation lens 4, and this light is made through the hole 231 of a substrate 1 as [carry out / to the light-receiving side (image pick-up side) of the CCD bare chip 12 / incidence].

[0208] Moreover, in this example, a predetermined gap is prepared between package 2A and the image formation lens 4, and package 2A is made in external force as [transmit / by the image formation lens 4 / at the time of a carrier beam / to that force / directly].

[0209] In this example the distance from the upper bed section of package 2A to the upper bed section of the image formation lens 4 1.5mm, The distance from the soffit side of 2.0mm and the image formation lens 4 to the top face of a substrate 1 for the thickness of the image formation lens 4 4.0mm, Distance to the soffit sections, such as the CCD bare chip 12 equipped with the thickness of a substrate 1 from the underside of 0.5mm and a substrate 1 at the underside side of a substrate 1 and components 234, can be set to 1.0mm. Since a substrate 1 can be arranged in the focal distance of the image formation lens 4 by equipping an image formation lens 4 and body side with the CCD bare chip 12 through a substrate 1 especially, compared with the example shown in drawing 3 , thin shape-ization is attained more. Consequently, the thickness of the sum total of this example is set to 9.0mm. Moreover, the die length of the horizontal die length and the perpendicular direction of this image pick-up equipment 100 can be set to 15mm. Therefore, as shown in drawing 50 and drawing 51 R> 1, it becomes possible to hold image pick-up equipment 100 in the interior of the case 301 of PC card 246 whose thickness is 10.5mm.

[0210] Drawing 53 shows the example of an electric configuration inside a personal computer 240. CPU311 is made as [perform / various kinds of processings] according to the program memorized by ROM312. In RAM313, CPU311 performs various kinds of processings upwards, and a required program, data, etc. are suitably memorized.

[0211] The PC card driver 315 besides a keyboard 242, the FD driver 316, and the modem 318 are connected to the input/output interface 314 connected to CPU311 through the bus, respectively. The PC card driver 315 is made as [receive / various kinds of data etc. / deliver and] to PC card 246, when equipped with PC card 246. Moreover, the FD driver 316 is made as [reproduce / data / to a floppy disk 317 / record or], when equipped with a floppy disk (FD) 317. It connects with communication lines, such as the telephone line, and a modem 318 carries out the reception recovery of the data inputted through the communication line, this is outputted to CPU311, or it modulates the data supplied from CPU311, and is made as [output / to a communication line].

[0212] The LCD driver 319 which drives LCD243 is connected to the input/output interface 314 again. Moreover, after A/D conversion of the sound signal inputted from the microphone 320 is carried out with A/D converter 321, it is made as [incorporate / by the input/output interface 314]. Moreover, after D/A conversion of the voice data outputted from the input/output interface 314 is carried out with D/A converter 322, it is made as [output / from a loudspeaker 323].

[0213] Next, the actuation is explained. For example, when performing a predetermined partner and a predetermined TV phone, a user equips the PC card applied part 245 with PC card 246, pulls out image pick-up equipment 100 from PC card 246, rotates at a further predetermined include angle, and makes it direct in the direction of [one's], as shown in drawing 51 .

[0214] Next, a user operates a keyboard 242 and inputs the telephone number of the other party. CPU311 controls a modem 318 for the input of this telephone number through an input/output interface 314 at the time of a carrier beam, and performs call origination actuation to that telephone number.

[0215] A modem 318 notifies that to CPU311, when call origination actuation to a phase hand is

performed and a phase hand responds to this call origination actuation corresponding to the command of CPU311.
[0216] CPU311 controls PC card 246 through the PC card driver 315, and makes a picture signal incorporate at this time.
[0217] In image pick-up equipment 100, after carrying out photo electric translation of a user's image with the CCD bare chip 12 through the image formation lens 4, A/D conversion is carried out with A/D converter 70, and it outputs to the PC card driver 315. The PC card driver 315 outputs the image data changed into the data of the format according to a PCMCIA criterion to CPU311 through an input/output interface 314. CPU311 supplies this image data to a modem 318 through an input/output interface 314, and makes it transmit to the other party through a communication line.
[0218] If the image data of the other party which has the same equipment on the other hand is sent through a communication line, a modem 318 will carry out the reception recovery of this, and will output it to CPU311. When this image entry of data is received, CPU311 outputs this to the LCD driver 319, and is made to display it on LCD243. By this, the other party's image will be displayed on LCD243.
[0219] On the other hand, the sound signal with which a user talks toward the other party is incorporated with a microphone 320, and A/D conversion is carried out with A/D converter 321. A modem 318 transmits this voice data through a communication line to the bottom of control of CPU311 at the other party.
[0220] Moreover, it restores to the voice data transmitted from the other party with a modem 318. After D/A conversion of this recovery voice data is carried out with D/A converter 322, sound emission of it is carried out from a loudspeaker 323.
[0221] Thus, a user only equips a personal computer 240 with PC card 246 which has an image pick-up function, and can perform a TV phone easily.
[0222] In addition, in the above example, although the image formation lens was constituted from one lens, an image formation lens can also be made to constitute from two or more lenses, as shown in drawing 44 .
[0223]
[Effect of the Invention] It has the drawing effectiveness which intercepts a marginal ray while the sheathing intercepts outdoor daylight according to the manufacture approach of image pick-up equipment according to claim 1 and image pick-up equipment according to claim 15, and photo electric translation of the holder with which one image formation lens to which image formation of the light is carried out is prepared, and the light by which image formation was carried out at least with the image formation lens is carried out, and the substrate with which it is equipped with the optoelectric transducer which outputs a picture signal is unified. Therefore, it becomes possible about image pick-up equipment a miniaturization, thin shape-ization, and to lightweight-ize, and the inclusion and handling can be made easy. Moreover, it becomes possible to use the optoelectric transducer of the number of low pixels.
[0224] According to image pick-up equipment according to claim 16, since the pitch of an effective pixel was set as the larger value than 1/(200F) of an image pick-up service area, the image pick-up equipment in which thin-shape-izing is possible is realizable by low cost.
[0225] Since it is directly [the optoelectric transducer to which a part of one image formation lens to which image formation of the light is carried out carries out photo electric translation of the light by which image formation was carried out with the image formation lens, and it outputs a picture signal, and] in contact according to image pick-up equipment according to claim 17, it is necessary it not only can to do so the same effectiveness as the case in claim 1, but to cease to carry out optical adjustment between an image formation lens and an optoelectric transducer.
[0226] According to image pick-up equipment according to claim 21, the optoelectric transducer and the A/D converter are built into one package. Therefore, it not only can do so the same effectiveness as the case in claim 1, but offer of the small image pick-up equipment which outputs digital image data is attained.
[0227] According to a signal processor according to claim 26 and the signal-processing approach according to claim 27, when carrying out A/D conversion of the picture signal, image data is delayed by the timing of a clock to have one half of the periods of the period to which a charge-coupled device

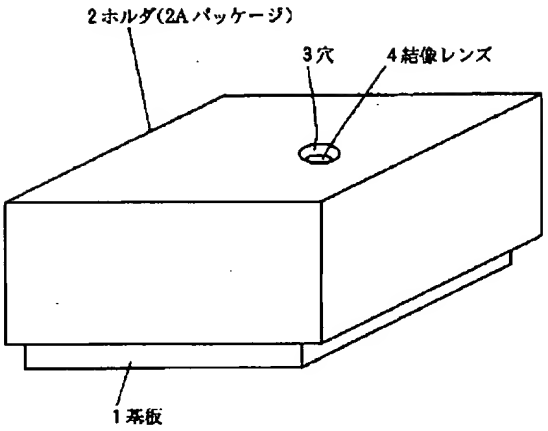
outputs a picture signal by one clock, and the difference of image data and the image data delayed by one clock calculates to it. And the difference is outputted alternately. Therefore, the noise component contained in the picture signal which a charge-coupled device outputs can be reduced.

[0228] Since the image pick-up equipment which unified the substrate and the holder was held in the case according to image pick-up adapter equipment according to claim 28, low cost-ization is attained at a miniaturization, thin-shape-izing, lightweight-izing, and a pan.

[0229] Since the picture signal outputted from the image pick-up equipment of image pick-up adapter equipment is incorporated and it was made to process according to an information processor according to claim 32 and the information processing approach according to claim 33, it becomes possible to transmit a picture signal simply in the location of arbitration.

[Translation done.]

【図1】



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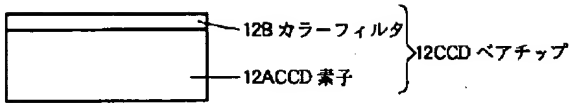

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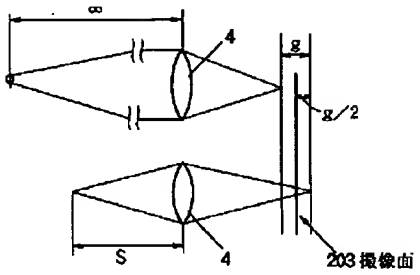

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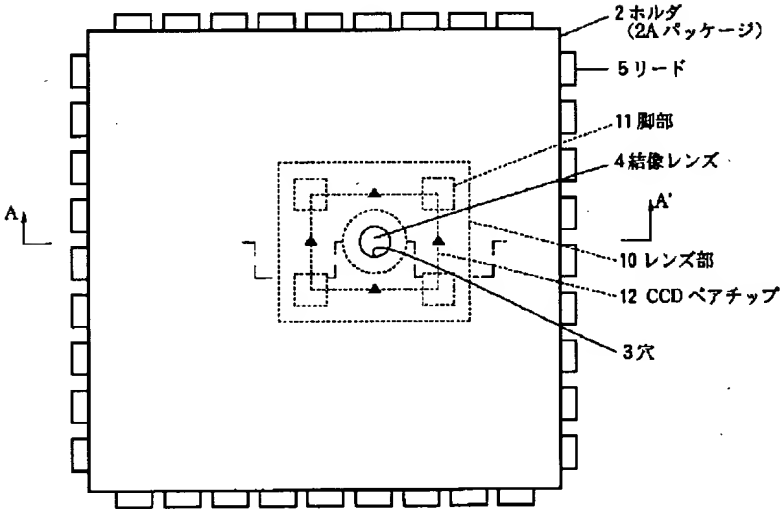

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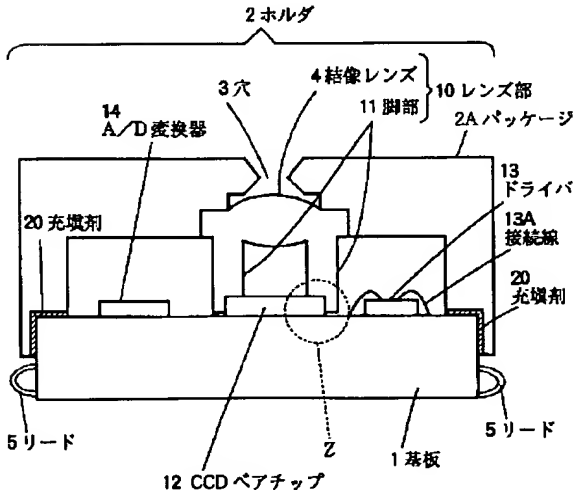

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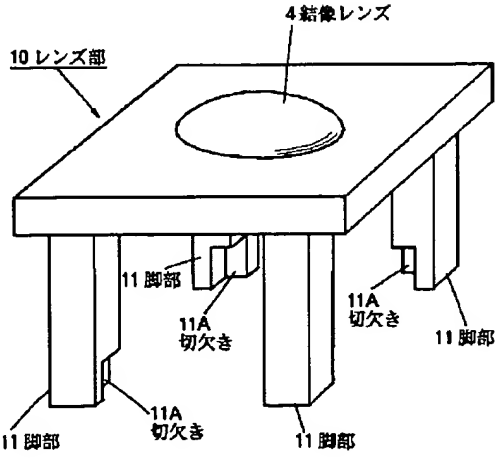

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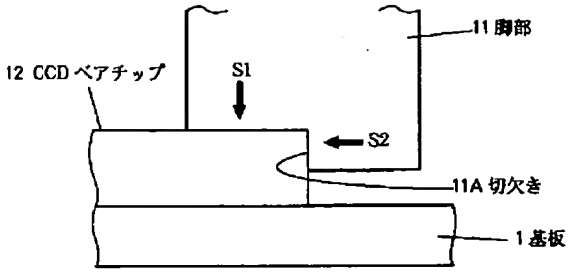

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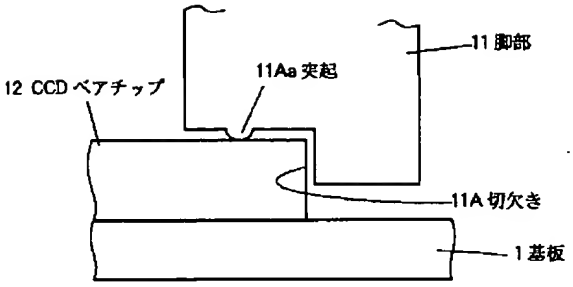

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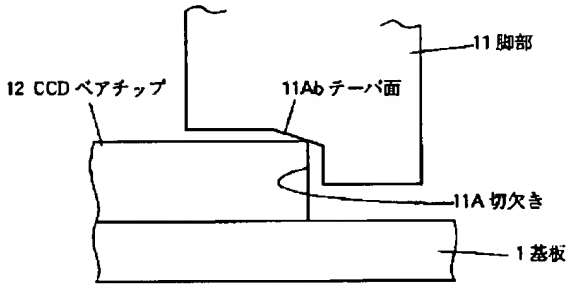

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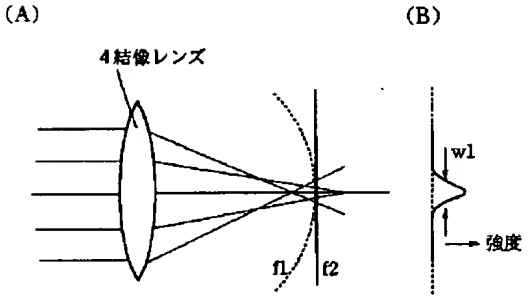

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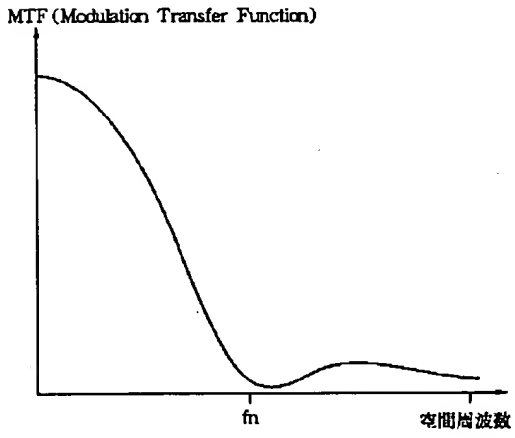

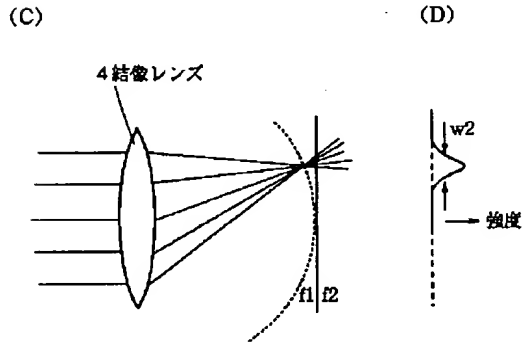

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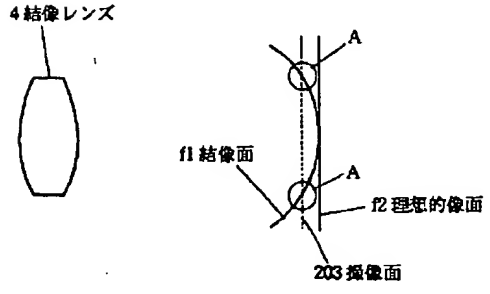

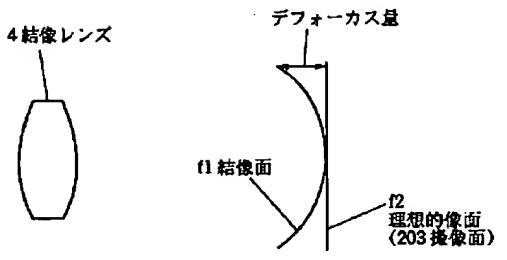

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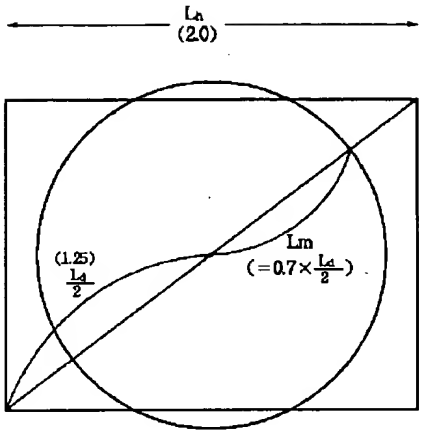

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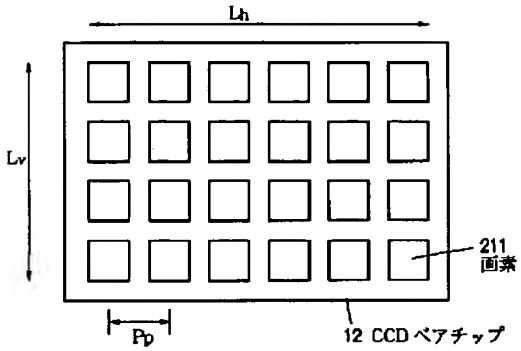

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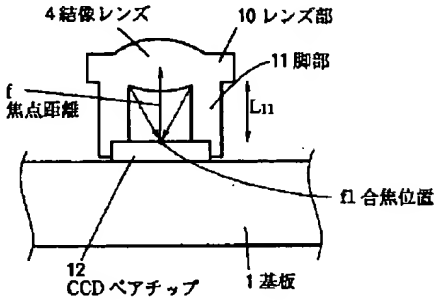

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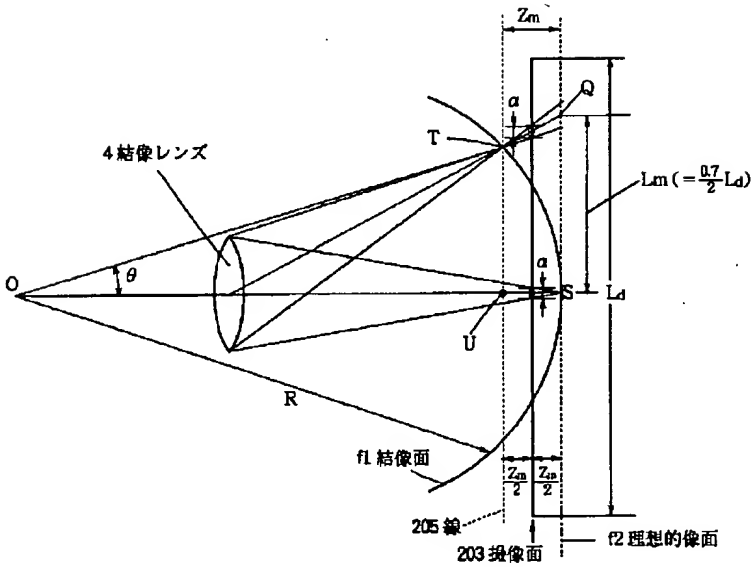

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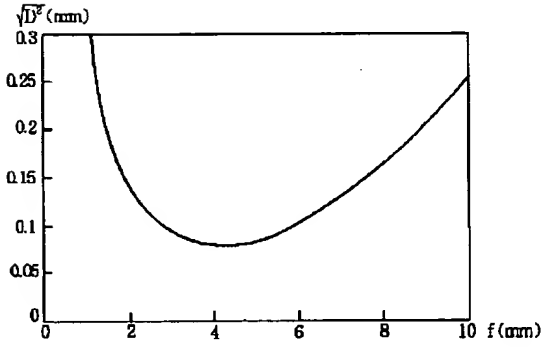

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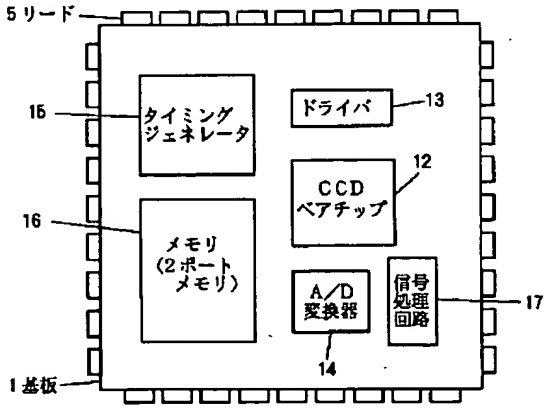

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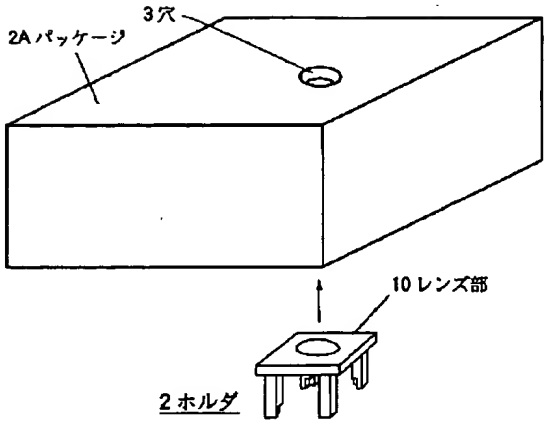

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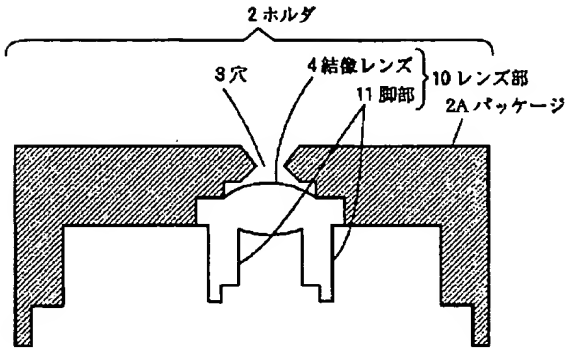

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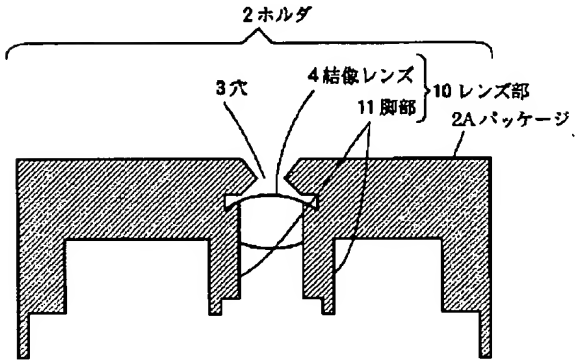

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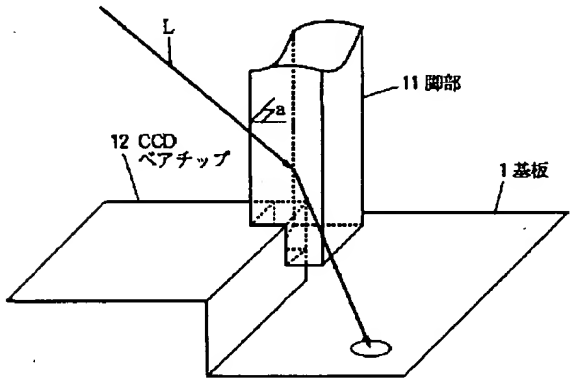

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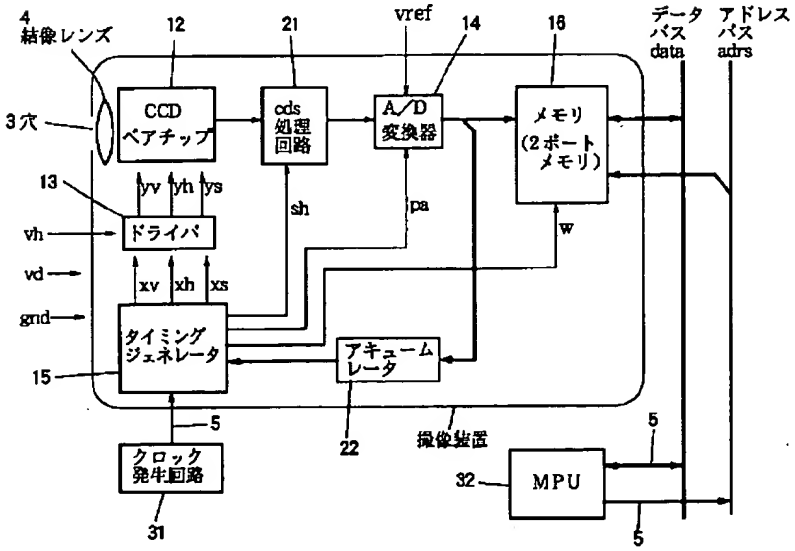

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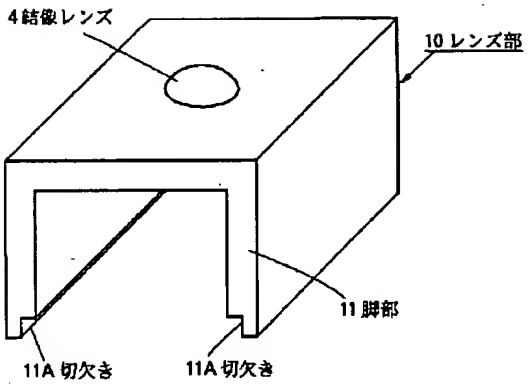

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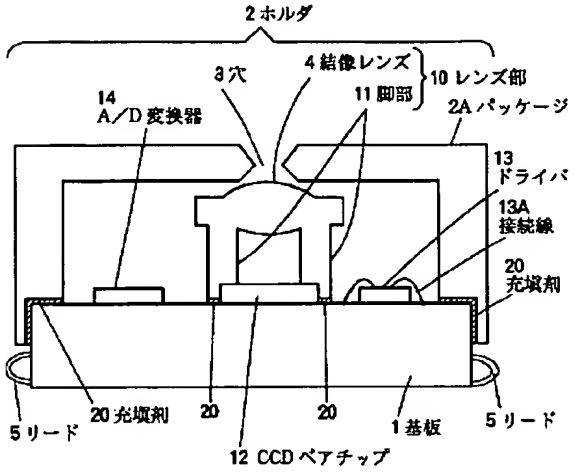

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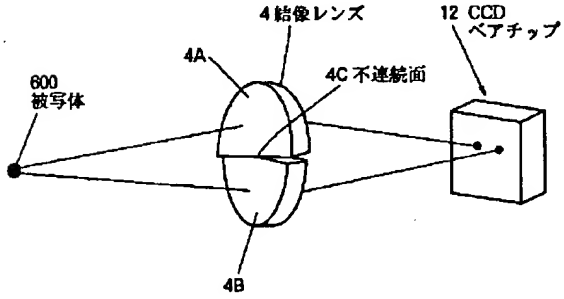

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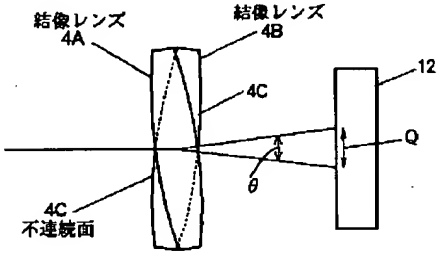

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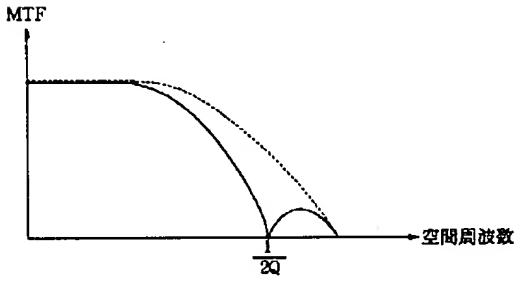

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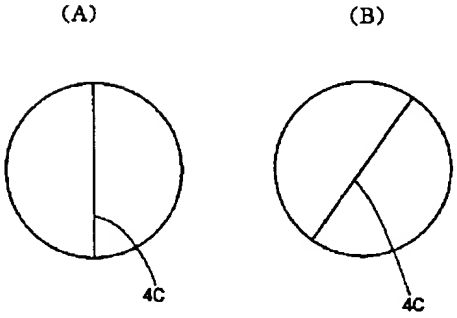

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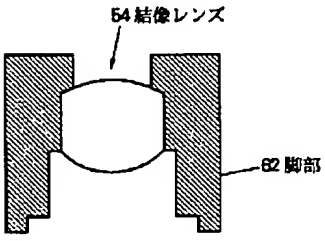

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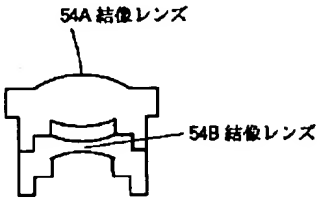

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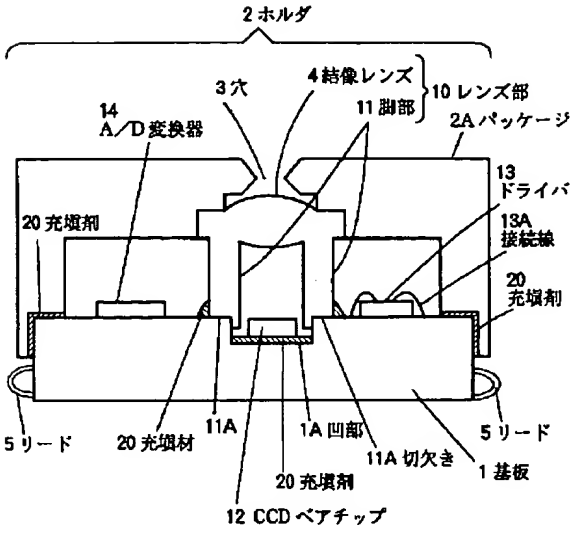

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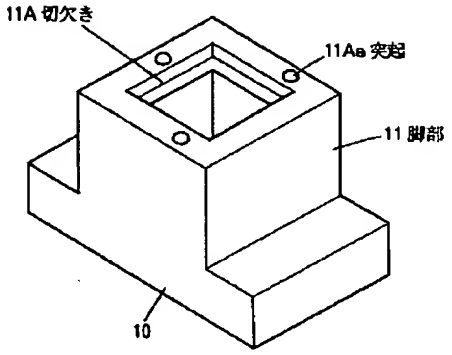

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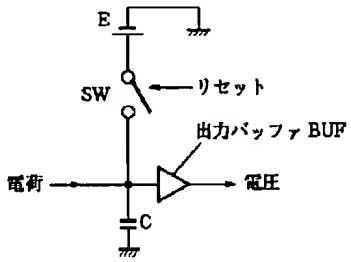

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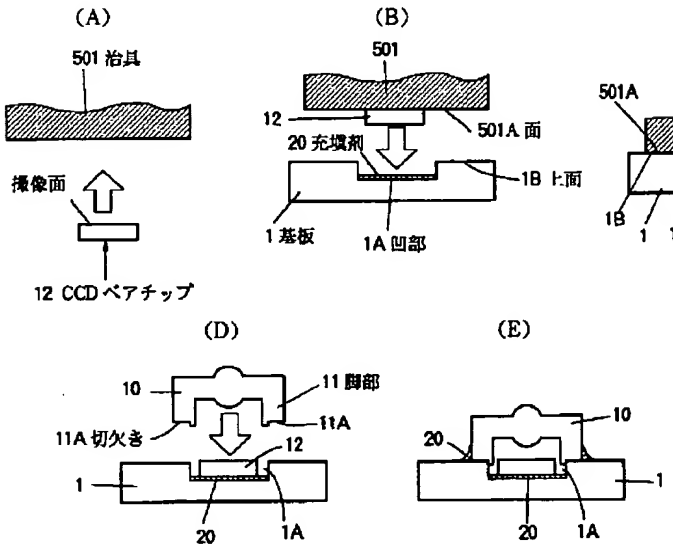

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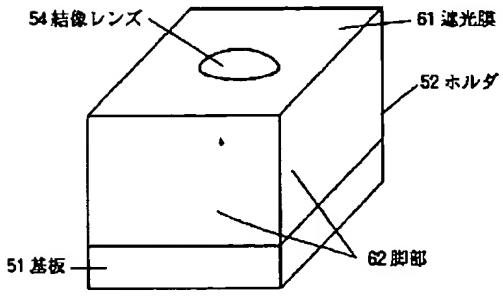

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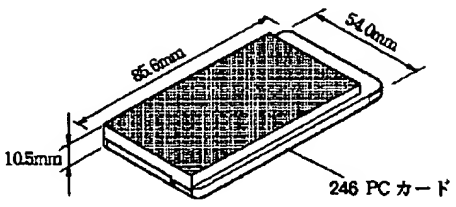

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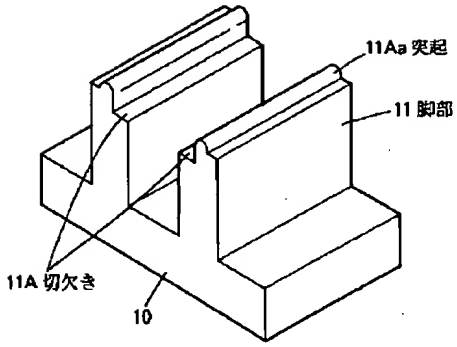

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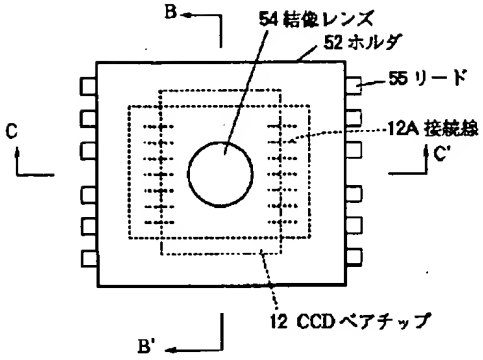

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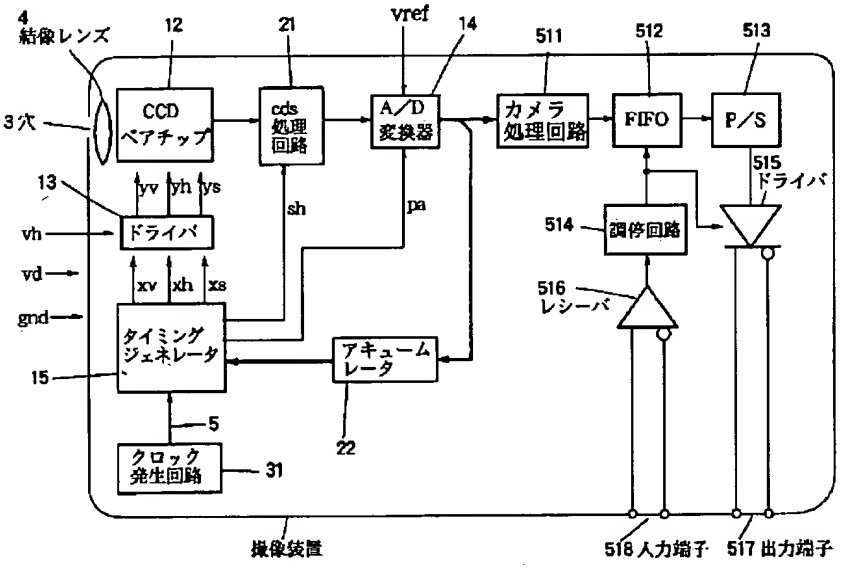

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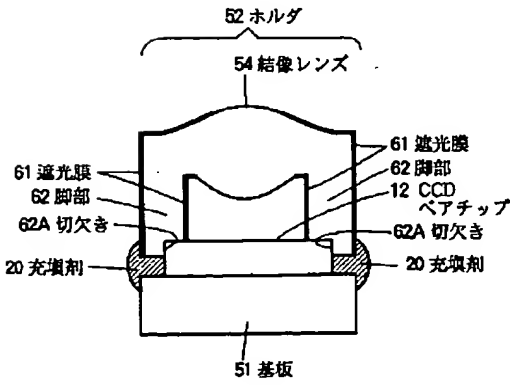

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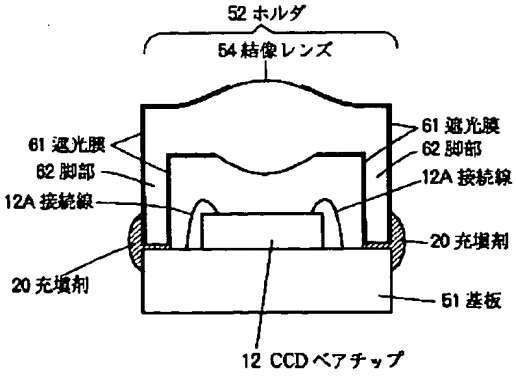

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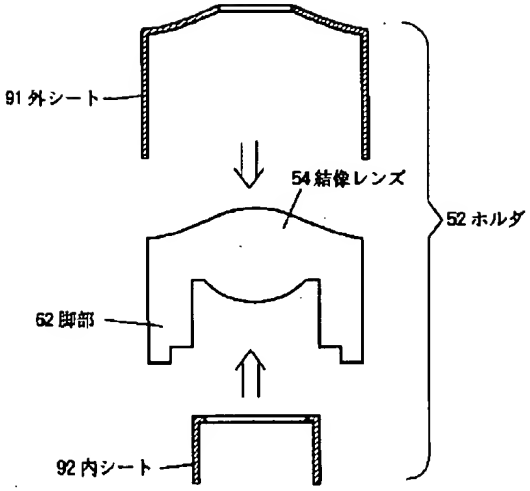

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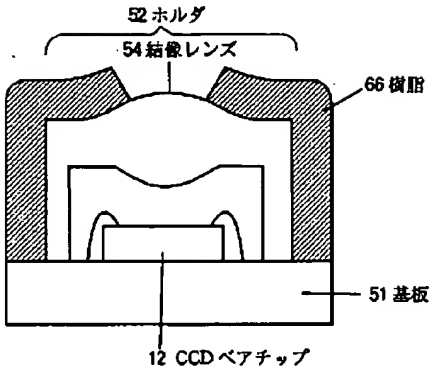

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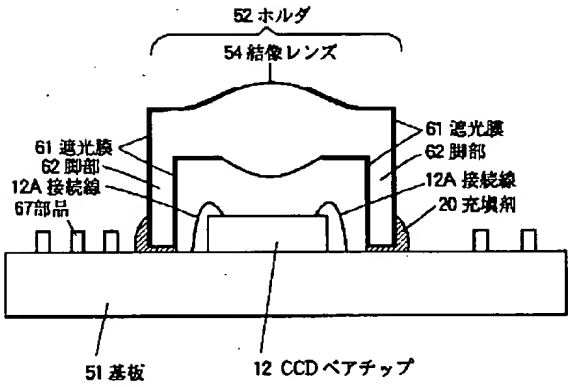

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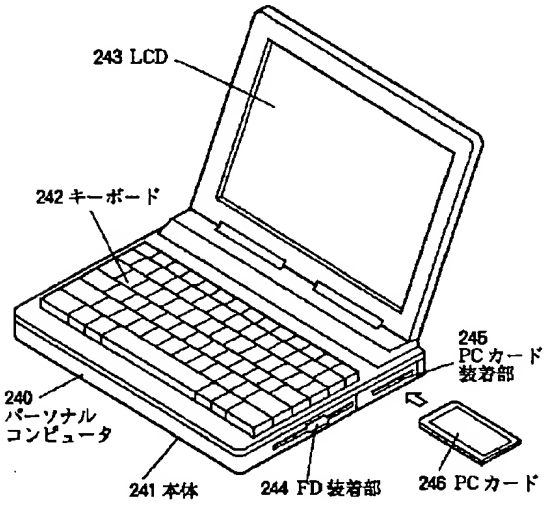

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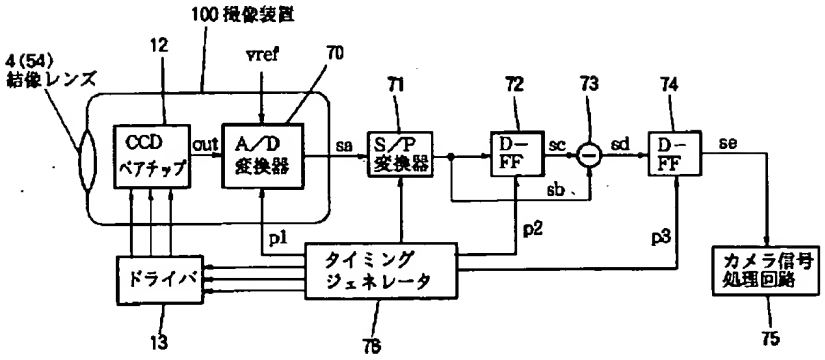

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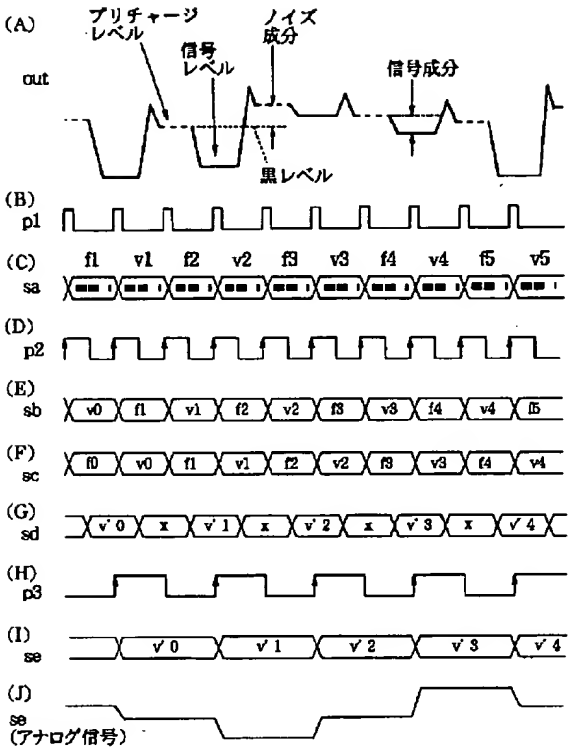

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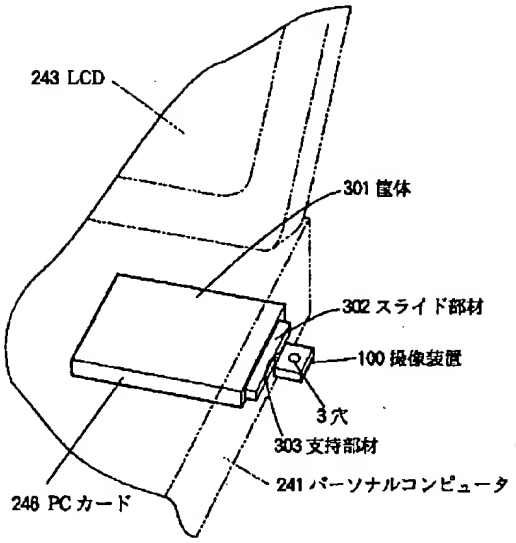

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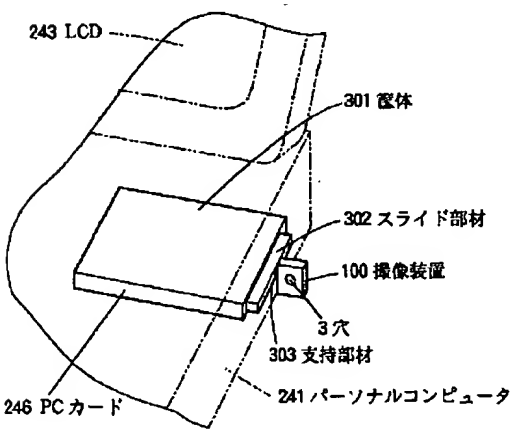
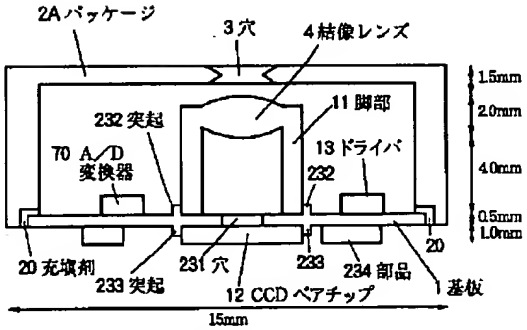
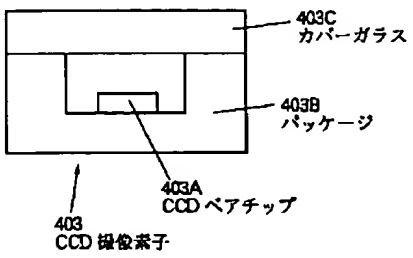


【図52】

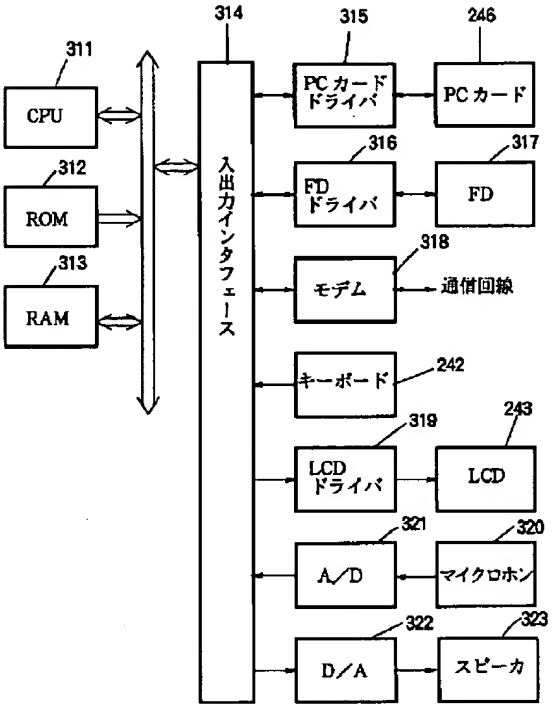


撮像装置 100

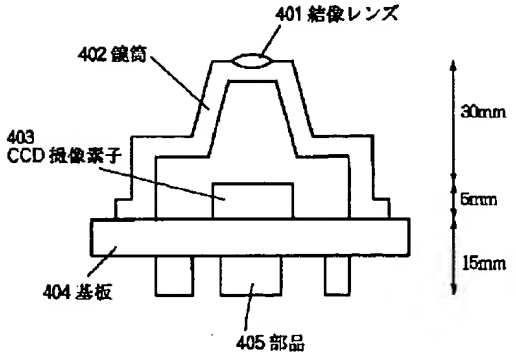
【図56】



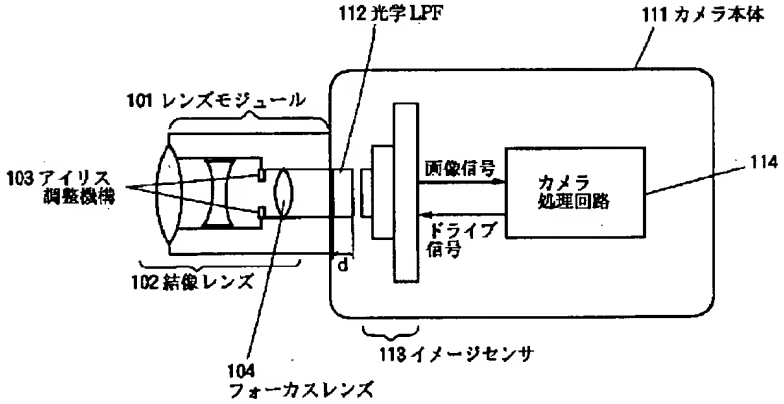
【図53】


314
315
246
311
CPU
PCカード
ドライバ
PCカード
316
317
312
ROM
FD
ドライバ
FD
318
313
RAM
モデム
通信回線
入出力インタフェース
242
キーボード
319
243
LCD
ドライバ
LCD
321
320
A／D
マイクロホン
322
323
D／A
スピーカ

【図55】


401 結像レンズ
402 鏡筒
403
CCD 撮像素子
30mm
5mm
15mm
404 基板
405 部品

【図54】


112 光学LPF
111 カメラ本体
101 レンズモジュール
103 アイリス
調整機構
画像信号
カメラ
処理回路
114
ドライブ
信号
d
102 結像レンズ
104
フォーカスレンズ
113 イメージセンサ